RAILROAD GAZETTE

FRIDAY, JUNE 10, 1898.

CONTENTS

Contributions.

When was a Locomotive Called a Mogul?

Adamsford Pa., June 6, 1898.

To the Editor of the Railroad Gazette:

Among my scraps I recently found one giving a cut of a mogul built by the Rogers Works for the New Jersey Railroad & Transportation Co. in 1863. Writing at once to the Rogers people for confirmation of this, they replied, stating that "The first mogul locomotive built by us was in the year 1863, as you state, and was for the New Jersey Railroad and Transportation Company." At the close of the letter they say: "The reason why this type of engine was so designated, we assume that these engines as first built were very large for their day, and it was common then, and is yet, to a certain extent, to designate anything particularly big or large as 'The Mogul,' or 'The Great Mogul.'" The foregoing will probably meet the comment in a recent number by "F" on my dates.

C. H. CARUTHERS.

[See the Railroad Gazette May 13, p. 335, and May 6, p. 321.]

The M. C. B. Journal Box Lid.

To the Editor of the Railroad Gazette:

The car equipment of this country provides an almost unlimited number of valuable topics for discussion by the several railroad clubs and the Master Car Builders' Association. Many of these subjects, for want of time or proper consideration, or a failure to get a clear understanding of what has been developed by reports or discussions, are left in an incomplete and unsettled state; or, if considered later, some modification is often adopted, as a compromise of different opinions, which is contrary to important principles brought out by experience and investigation.

In a certain measure this will apply to the question of journal box lids, which question was discussed at the Master Car Builders' Conventions in 1889, 1890 and 1891.

Owing to differences of opinion that apparently could not be harmonized, a compromise lid was finally adopted in 1891, which has since been the standard, notwithstanding the fact that it was inferior to some others considered. With the present M. C. B. lid a considerable quantity of dirt and grit finds its way into the journal box, especially at the top, where the irregular form of the face of the box precludes the practicability of close fitting joints. Another serious objection to the present arrangement is that the action of the spring is always to press the top of the lid away from the box.

The discussion in 1890 and 1891 preceding the adoption of this standard showed that the principal objection to the flat lid, known as the Fletcher, was that the wear of the bottom edge of the lid and the ledge on the box, in time, allowed the lid to drop down sufficiently to cause an opening over the top edge. It is true that this occurred with the form of lid then used and referred to in the discussions, but an absolute remedy which entirely removes the objection is had by simply flanging the bottom edge of the lid, so that a wide bearing is provided as compared with the $\frac{1}{16}$ in., which is the ordinary thickness of pressed steel lids.

When malleable or cast iron Fletcher lids of the old form were used the weight of the lid was the principal cause of failure, together with the fact that in many cases the projection on the box for supporting the lid at the bottom edge did not extend across the full width of the box, and this, together with the weight of the lid, soon resulted in its wearing, as previously described.

From a number of years of observation it is apparent that what is needed is a lid with a flat surface and no irregular shapes, which requires a perfectly plain, straight surface on the face of the journal box. It is also clear that in the cheapest possible way a lid of this type can readily be made to fit tightly and exclude the dust and dirt and be a source of economy in the proper maintenance of the packing in journal boxes. With lids of the Master Car Builders' type the packing soon becomes completely covered with dust and dirt, which is very detrimental to the proper running of journals and brasses.

A little reflection as to the relation between journal box lids and the economical and successful lubrication of journals will certainly indicate that the lid required is one that in first cost will be slight and yet embody the features that will exclude dust and dirt. As previously stated, to meet these conditions straight surfaces are required on the face of the box, as well as a straight or perfectly flat form of lid; in this way a tight joint can be made between the two flat surfaces, which cannot be secured with the irregular shapes used in the standard Master Car Builders' lid.

The logical conclusion is that the M. C. B. standard journal box lid is wrong in principle, and if it cannot be revised so as to embody the conditions outlined the railroads will certainly follow the action already taken by a few leading roads and adopt a lid having a perfectly flat surface, which provides a tight joint for the exclusion of dust and dirt.

The possible economies in car lubrication are so well known to those directly responsible for the maintenance of cars that an extended discussion of this point is unnecessary. It might be well, however, to note that the total car equipment now represented in the Master Car Builders' Association is approximately 1,200,000 cars, there being, in round numbers, at least 9,600,000 journal boxes to maintain that are open to the objections above stated. INSPECTOR.

The Class H-5 Consolidation of the Pennsylvania.

Last December we published engravings and description of a new consolidation engine of great power, built at Altoona, for the Pennsylvania Lines West of Pittsburgh, known as the Class H-4. This engine has been somewhat revised, and Class H-5 is now produced as perhaps the most powerful engine ever built. We cannot yet publish details of the parts, but show a diagram giving the principal dimensions, and comparative figures are given in the table below:

	Class H-5.	Class H-4.
Cylinders	23½x28 in.	22x28 in.
" spread	90 in.	88 in.
Tubes, number	306	316 or 263
Tubes, outside diameter	2¼ in.	2 or 2¼ in.
Tubes, length bet. sheets	14 ft.	14 ft.
Firebox, inside	10 ft. x 40 in.	8 ft. 10 in. x 40 in.
Heating surface tubes, sq. ft.	2,524	2,316 or 2,168
Heating surface firebox, sq. ft.	197	154
Heating surface, total	2,721	2,470 or 2,322
Steam pressure	185 lbs.	185 lbs.
Weight, working order	208,000 lbs.	173,370 lbs.
" on first drivers	46,000 "	35,207 "
" on second drivers	46,000 "	40,968 "
" on third drivers	48,000 "	39,838 "
" on fourth drivers	46,000 "	40,047 "
" on truck	22,000 "	17,210 "
" of tender, loaded	104,600 "	104,600 "
Water capacity	6,000 gal.	
Coal capacity	22,000 lbs.	
Least int. diam. boiler	71 in.	68 in.
Drivers, diam	56 in.	56 in.
Engine wheel base	25 ft. 11⅛ in.	25 ft. 5 in.

A comparison of these two classes shows that the H-5 has a larger firebox, boiler and cylinders, which result in an increase in total weight of 33,700 lbs. and an increase of the weight on the driving wheels of 29,900 lbs.

The saddle casting of the H-5 consists of one piece to which the cylinders are bolted, and while this is a departure from the usual practice of the Pennsylvania Railroad, a similar cylinder arrangement was used on the Purdue locomotive, Schenectady No. 2, illustrated in our issue of December 17 last. The injectors are both mounted on the boiler head within easy reach of the engineman.

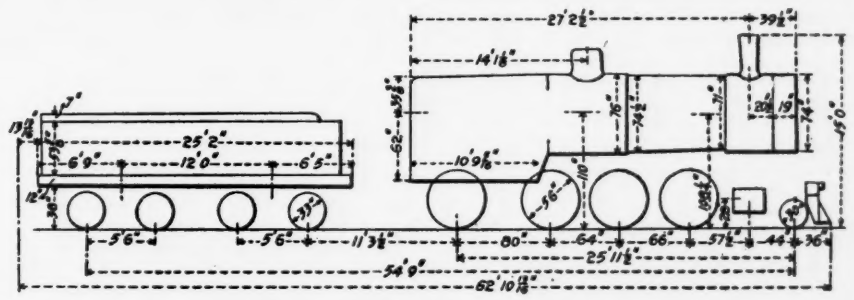
The new engine is now being used as a helper on the eastern slope of the Allegheny mountains, and is backed down after each trip. Some idea of the size is had from the fact that none of the turntables at Altoona are large enough to permit this engine to be balanced, and it has never been turned since leaving the shop. Also, the weights given are calculated, as the scales at Altoona are not of sufficient capacity to weigh this machine. The service tests so far made indicate that the H-5 engine will considerably exceed its calculated hauling power, and will probably be able to do almost double the work of the class H-3b consolidation locomotive.

It is interesting to compare the new Pennsylvania consolidation locomotive with the Great Northern 12-wheeler, which we illustrated January 7, of this year, as the largest locomotive ever built. Following are some of the leading dimensions as published at that time.

Dimensions of 12-wheel Locomotive, Great Northern Railway.

Cylinders	21x34 in.
Firebox	10 ft. 4 in. x 40½ in.
Heating surface tubes, sq. ft.	3,045
" " firebox, sq. ft.	235
" " total	3,280
Steam pressure	210
Weight in working order, total	212,750 lbs.
" on drivers	172,000 "
" " truck	40,750 "
Least internal diameter of boiler	76¾ in.
Drivers, diameter	55 "
Engine wheel base	26 ft. 8 "

Indicator cards from the Great Northern engine show that at long cutoffs the mean effective pressure is about 90 per cent. of the boiler pressure, and on this basis the theoretical tractive power is found to be 51,525 lbs.; for comparison the ratio between the mean effective and boiler pressures for the H-5 engine, when working under similar conditions, can also be taken as 90 per cent., which gives the corresponding figure, 45,956 lbs. It would therefore at first appear that the Great Northern engine should be able to exert 5,569 lbs., or 12 per cent. greater tractive effort. In this connection, however, it is important to note that the H-5 engine has a weight on the drivers of 186,000 lbs., and the Great Northern engine 172,000 lbs., or, in other words, the H-5 has 8 per cent. greater tractive weight. The ratio between the theoretical tractive power and the weight on the driving wheels, for the H-5 engine is 25 per cent. and for the Great Northern engine 30 per cent. In the common meaning of the term, the Great Northern engine is over-cylindered, while the weight and cylinder power of the Pennsylvania engine are proportioned nearer in accordance with the usual rule, that the tractive effort should not exceed one-fourth the weight on the driving wheels. This means that the new consolidation engine of the Pennsylvania is less liable to slip the drivers than the Great Northern engine, and because of its greater tractive weight, should really be able to haul heavier loads. If this is true the class H-5 is the most powerful eight-coupled locomotive so far built.



Class H-5 Consolidation Engine—Pennsylvania Lines.

Standard 60,000 Pounds Capacity Box Cars—Lake Shore & Michigan Southern Railway.

The accompanying engravings show the construction of the new standard 60,000 lbs. capacity box cars of the Lake Shore & Michigan Southern, 500 of which are now building by the Buffalo Car Mfg. Co., Buffalo, N. Y. These cars, designed by Mr. A. M. Waitt, General Master Car Builder, are 34 ft. long and 8 ft. 9 in. wide over sills, and have a clear length inside of 33 ft. 3¼ in. and a clear inside width of 8 ft. 2¼ in. The height from the bottom of the sheathing to the top of the eaves is 8 ft. 11 in., from the top of the rail to the top of the brake shaft is 14 ft., while the bottoms of the sills at the center are 3 ft. 4½ in. above the top of the rail, the camber at the center being 1¼ in.

The side, intermediate and center sills are of long leaf yellow pine, all 4½x8 in., the end sills are white oak 8x8 in., and the cross-tie timbers, 4x8 in., are also of oak. Either yellow pine or oak is allowed for subfloor timbers, which are 5x5 in. in section and extend from the center of the body bolsters to the cross-tie timbers. The buffer blocks, 6x10¼x36 in., are white oak.

The corner posts are white oak dressed to 5x5 in., while the door posts are either of oak or yellow pine 4¾x5¼ in. The body posts, side and end braces, 2½x5 in., and the end posts, 3½x4 in., are either of oak or yellow pine, and all set in cast iron pockets with suitable dowels for framing. White oak girths are used, those on the sides being 4x3⅜ in., while the end girths

are 4x4⅜ in.; the side plates are yellow pine 4x6½ in., extending from outside to outside of the end plates, which are white oak. The outside sheathing is pine ⅞ in. thick and covers the sides and ends; these boards show a face of 5¼ in., have a V groove in the center, while the edges are beveled to show a similar groove between the joints. For the inside matched sheathing is used, also ⅞ in. thick, which is laid horizontally and extends from 2 in. above the floor to ½ in. above the lower edge of the girth; above the girth the sides are lined with two boards 19 in. wide jointed together with a tongue and groove. The ends of the car are sheathed from 2 in. above the floor to 1½ in. below the lower edge of the end plate with ⅞ in. matched pine, laid horizontally. The flooring, 1¾ in. thick, is dressed and matched pine not less than 6 in. wide nor more than 10 in.

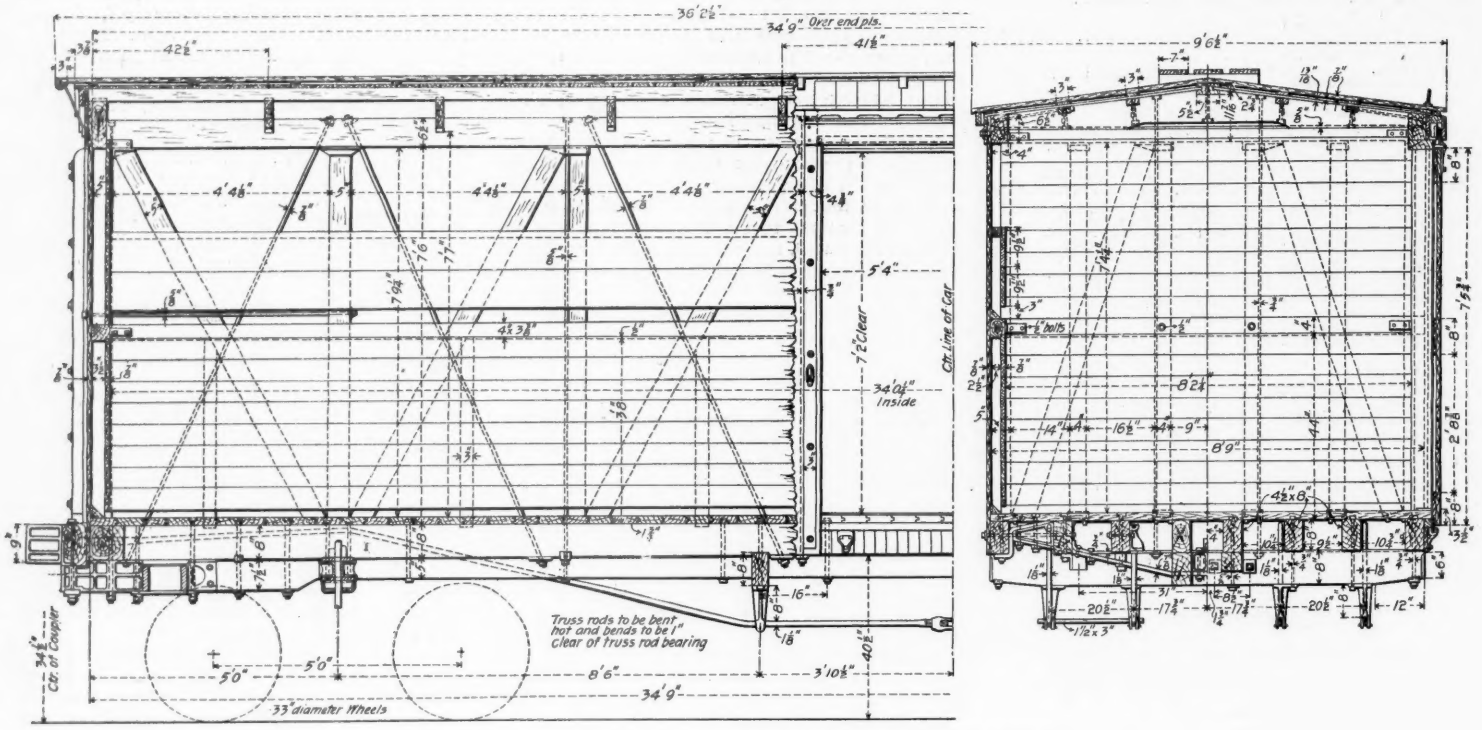
The car lines are yellow pine 8¼ in. deep at the center and tapered to 2½ in. at the shoulder of the tenons, the ridge piece and purlines, 1¾x5 in., being also of pine. The running board consists of three pieces of white pine, rough on the upper side and dressed on the lower, each of which is 1x7 in., and spaced 1½ in. apart, making the full width of the board 24 in. The Cleveland-Chicago 1892 roof is used.

The door openings are 5 ft. 4 in. wide and 7 ft. 2 in. high in the clear and Security doors are used, such as were illustrated in the Railroad Gazette of August 13 last. The cars are also equipped with Westinghouse automatic air brakes and National hollow brake-beams.

The centers of the body bolsters are placed 5 ft. from the outside of the end sills, and each consists of three pieces of wrought iron and suitable malleable iron distance pieces. The top or tension member is ¾ in. thick by 8 in. wide and rests on the top of the floor timbers and extends down the inside and underneath the bottom of the side sills. The bottom or compression member is ⅞x8 in., and the ends are turned up to fit closely the top member. The center member, ¾x8 in., extends between the outside intermediate floor timbers, underneath the other floor timbers, and is let into them ⅜ in. Between the center and bottom members of the bolster at the center is fitted a malleable iron distance piece, and cast iron distance pieces are used beneath the inside intermediate floor timbers. A malleable iron filling piece is fitted in the end of the bolster, which also serves as a truss rod saddle. The members of the bolster are fastened together and to the floor timbers by two ⅞ in. bolts which pass through the center sills and center plate and two ¾ in. bolts through each of the intermediate floor timbers and side sills. Two horizontal ¾ in. bolts pass through the bolster and side sill and two vertical ¾ in. bolts pass through the top and bottom members and filling piece at the end of the bolster, tying them together. The center and bottom members are further fastened by two ¾ in. rivets near the ends of the center member.

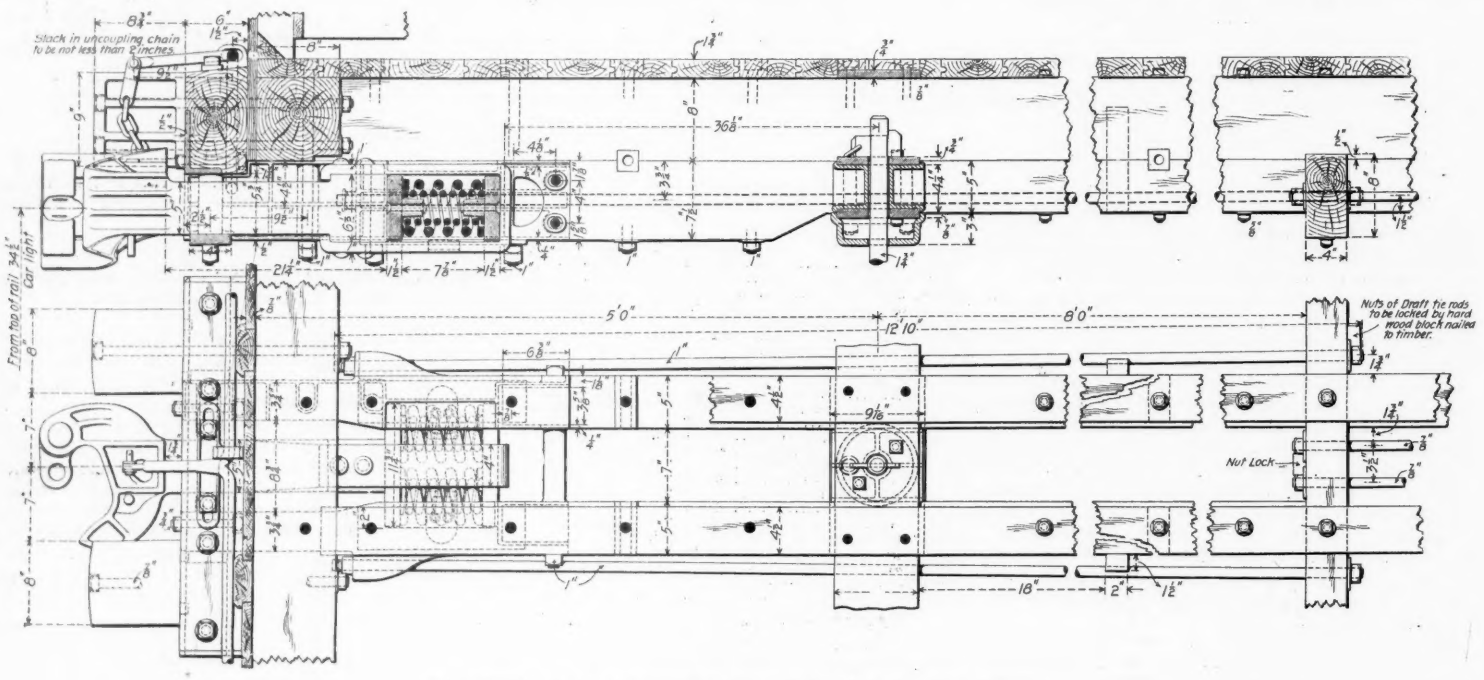
draft arms, draft timber and cap. Extending from the draft arm to the center of the bolster a 7½x5 in. white oak timber is fitted beneath each center sill and fastened to it by two 1 in. bolts. The bottom drawbar guides are ½x4 in. wrought iron plates, and malleable iron castings riveted to the drawbar guides form a guide for the drawbar pocket. Each draft arm is connected to the cross-tie timber by a 1 in. rod passing through a lug on the outer side of the arm.

The M. C. B. standard spring pocket is used, with turned down ends made of 1x4 in. wrought iron fastened to the end of the coupler by two 1⅛ in. rivets. The follower plates are 1½x6x11¾ in., and have two cast iron thimbles riveted to each plate to hold the draft springs in place. It will be noted that the spring arrangement is peculiar in that two draft springs are used for each coupler, each spring being a double coil of crucible steel 8⅛ in. high; the outside coil is 5½ in. outside diameter and made of 1⅛ in. diameter bar, while the inner coil is 3⅛ in. in diameter and made from a $\frac{11}{16}$-in. bar. The capacit of each double coil is 16,000 lbs. with a free motion of 1⅞ in. It is stated that cars fitted with the double spring draft attachments show a less cost for repairs



60,000 Pounds Capacity Box Car—Lake Shore & Michigan Southern Railway.

Designed by Mr. A. M. Waitt, *General Master Car Builder.*



Draft Rigging for Box Cars—Lake Shore & Michigan Southern Railway.

The side bearings are cast iron, fastened by three ¾ in. bolts, and the center plates, of pressed steel, are secured by four ⅞ in. bolts. The center pin is wrought iron 1¾ in. in diameter by 24 in. long, and is held in place by a key and ring.

The draft rigging is shown in detail by the engraving. Malleable iron draft arms, made by the Gould Coupler Co., are used, so spaced as to give a pocket 12 in. wide for the follower plates. These arms are secured to the floor frame by three 1 in. bolts, and are tied together by two 1 in. bolts passing through the

The trucks are entirely of metal, with a wheel base of 5 ft., and are shown by the detail drawings. The side frames are formed of arch-bars, which differ from the usual practice in that all bends are made with a 4 in. radius, and Mr. Waitt says that none of the frames made in this way have broken at the bends, whereas, with the usual sharp bends, fractures of the frames at such points were common.

The latest form of the Simplex truck bolster is

used, which has for a compression member a 12 in. steel channel, while the lower or tension member is a steel plate ⅝x10 in. The ends of the channel are bent to suit the angle of the lower plate, which in turn has its ends bent over and riveted to the web of the channel. A malleable iron center post is used, as well as malleable iron end castings, the latter having on the inner sides projecting shelves, upon which the channel flanges rest. None of the rivets in the truck bolster are depended upon to transmit the stresses from one member to another. The spring plank consists of a 12 in. steel channel, with the flanges placed down, and the flanges are notched out to receive the arch bars. The bolster springs are graduated, arranged in groups of four double coils, and secured between malleable iron top and bottom plates ¼ in. thick. The outside coils are made from 1 in. open hearth steel bars, are 6 in. outside diameter and 6½ in. high. The inside cells are of $\frac{11}{16}$ in. round bar steel and are 3⅞ in. outside diameter and 5⅝ in. high. The bolster springs compress ¾ in. under a load of 10,000 lbs. on each group, 1¼ in. under a load of 21,500 lbs., and have a total capacity of about 45,000 lbs. and a free motion of 2 in.

The column guides are malleable iron castings, the journal boxes of the McCord pattern, and Soule dust guards are used. The axles are of the standard M. C. B. dimensions for 60,000 lbs. capacity cars and are forged from open hearth steel. The specifications provide that the steel used for axles should contain not over .04 per cent. of phosphorus, .04 per cent. of sulphur and not to exceed .28 per cent., nor less than .23 per cent., of carbon, nor more than .60 per cent of manganese.

Piston Valves.

The use of piston valves for the purpose of distributing steam to the cylinders of locomotives has received considerable spasmodic attention from those who have been interested in locomotive engineering, but it is only during recent years that the use of the same has been accepted generally as warranted by the results obtained. A particular type of locomotive, the main valves of which are of the piston type, has been running for a number of years, and the success of this type, together with the impression which generally prevails that any piston valve is as nearly perfectly balanced as is possible, have, no doubt, contributed much toward creating the present widespread interest in piston valves. The use of piston valves in the type of locomotive referred to above has certainly been very successful, and this declaration and the one that there is shown a very general interest in piston valves at the present, will probably need no further explanation.

It seems to be the general belief that any piston valve must, on account of its form and design, be perfectly balanced, or, if not perfectly balanced, then as nearly so as it is possible to make any valve; before giving facts to prove that a piston valve may or may not be as well balanced as a slide valve it is best to mention something about the experience which has been had in developing the piston valve. It should be said here that, although some or all of these remarks may apply equally well to locomotive and other steam engineering work, the locomotive engineering branch is particularly in mind while formulating them.

The first experiments with the piston valve in locomotives showed that the edges of the packing rings of the valve were the controlling edges of the valve, whereas the ends of the valve proper had been considered as such. The rings had been set back from the ends of the valve to leave support for the rings, and the first changes suggested were that the outer edges of the rings be made flush with, or project beyond, the ends of the valve proper. This change was made to prevent wire drawing the steam around the ends of the valve after the rings had uncovered the ports. It was found also that the narrow rings cut the valve casing at the bridges in the steam passages, the area of the bridges exposed to wear of the valve and rings being quite small compared with the wearing area of the remainder of the cage, the bridges were soon worn below the surface of the solid metal and the rings would catch on the edges of the latter, providing, of course, the rings were narrow, as they generally were.

There was nothing more natural then than that the wide ring should make its appearance, wide enough to produce minimum wear in the bridges across the port and wide enough to span the port, so that the ring could not drop into the port when the bridges wore below the surface of the cage, and wide enough to produce the unbalanced piston valve.

It will be readily understood that when the packing ring is over the port the outside of the ring is exposed to whatever pressure there may be in the cylinder, which is, just at the point of cut-off, the maximum pressure in the cylinder, and the total pressure acting to compress the ring is found by multiplying the width of the port or the width of the ring, whichever is the less, by the circumference of the ring and by the pressure in the cylinder. There must then be an equal or greater pressure forcing the ring outward to prevent collapse of the ring and leakage either from or to the cylinder. This balancing pressure is obtained by admitting steam chest pressure to the space between the ring and the body of the valve to set the ring out, just as with spring ring cylinder packing. This balancing pressure is constant and may balance the ring while the ring is over the port, but as the ring passes from the port the pressure, both in pounds per square inch and in total pressure, decreases and the ring, hence also the valve, becomes unbalanced. In other words, the pressure on the inside of the ring is constant, the pressure on the outside of it is variable, its amount varying with the surface which is over the port; a piston valve can be balanced between the two extremes.

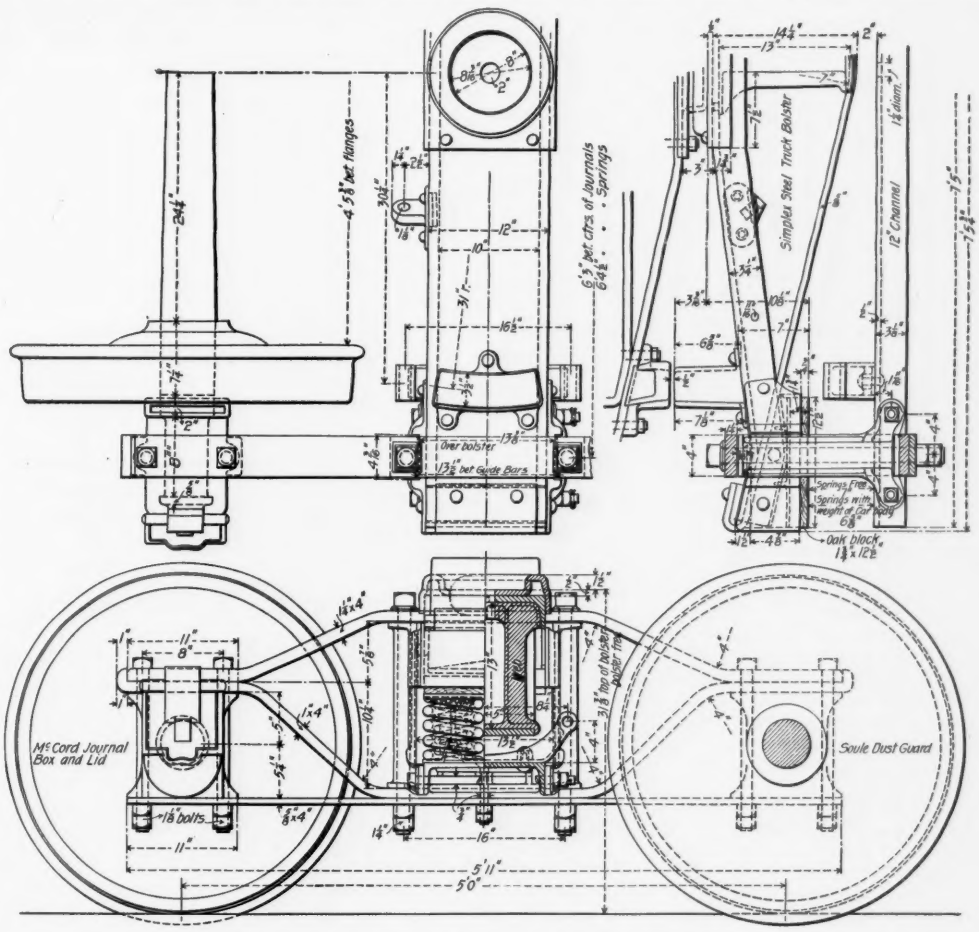
The ordinary D slide valve can be balanced nearly to the point at which the pressure under the valve raises the valve from the seat and allows steam to pass between the valve and the seat either to or from the cylinder, usually the latter.

In the accompanying table there is given the unbalanced pressure on two kinds of piston valves and the unbalanced pressure on a slide valve which has given very good results in service and which is balanced in accordance with accepted rules. The two piston valves included in the table are in use at the present time, there being a number of locomotives in service using the valve B. In making the calculations for the piston valves both ends of the valve were considered and also the relation of each ring to its port at the particular point for which the calculations were made, so that the amount given in the column headed "Pressure forcing valve (or, in the case of the piston valves, the rings) against seat" is the total unbalanced pressure on the valve; or, in other words, if to this amount were added the weight of the valve and the sum multiplied by the coefficient of friction between the valve and its seat the product would be the pounds pull or push on the valve stem necessary to slide the valve. The same steam chest pressure and cylinder pressures were taken for the corresponding points of each valve.

Points for which calculations were made—	Pressure Forcing Valve Against Seat. (lbs) Valve A.	Valve B.	Valve C.
Valve on center, no steam in cylinder	16,106	32,504	6,460
At beginning of admission	9,905	19,690	2,356
At ¼ port opening	9,714	22,894	1,330
At ½ port opening	9,478	26,097	1,330
At ¾ port opening	8,132	29,301	2,356
At full port opening	7,382	29,678	3,895
At cut-off	16,106	19,690	2,356

Valve A is a D slide valve; valves B and C are piston valves. The table shows that some piston valves are better balanced than some D valves, and that there are some piston valves which are not as well balanced as the D valve. It is a fact that there are some piston valves even more nearly balanced than the valve C, but indicator diagrams from which to judge whether they cause the steam to be wire-drawn or not are not accessible.

The one other principal advantage claimed for piston valves is that the length of passages between valve seat and cylinder may be shorter when the piston valve is used, and this may receive attention at another time. W.



Metal Truck for Box Cars—Lake Shore & Michigan Southern Railway.

Steel Platforms for Passenger Cars.

Few of the car appliances and attachments shown at the last convention have since met with more general approval than the steel platform of the Standard Coupler Co., illustrated in our issue of Feb. 5, 1897. Steel platforms, we believe, were first used extensively on Pullman cars, and about three years ago what is now known as the "Standard" platform was adopted by the Pullman Company. About two years later it was put on the market, and now these platforms are used on nearly eight hundred cars by thirty-four different roads, and have been recommended by the Government for use with postal cars.

The weakness of the wooden platform has been a subject for discussion for so long that it is unnecessary at this time to more than refer to its chief defects, which are best shown by the drooping of the outer end and failure to resist lateral strains in ordinary service, and also by the telescoping of cars in cases of collision. Some comparison of wood and steel platform construction, however, may not be out of place.

In the steel platform, instead of the wooden timbers four steel I-beams are used, and because of their greater strength no truss rods are needed. The truss rods of the wooden platform, while intended to prevent drooping, do not strengthen the platform so as to resist either lateral strains or prevent it being broken upward in case of collision or other severe shocks. Also where wooden beams are used they are supported by the end sills of the car, and the platform being a cantilever construction the pulling and buffing forces produce a bending movement about the end sill. In the steel construction the I-beams extend about 5 ft. back of the transom, and because of their stiffness the support is mainly at the car transom, thus relieving the end sill of this load. The wooden timbers are also weakened by bolt holes where they are joined to the end sill, being the point where the stress is a maximum; whereas care is taken in the steel construction that no bolts shall pass through the flanges of the I-beams, the connections being made to malleable iron brackets, which are in turn riveted to the I-beam webs.

Some further features of the steel platforms may be mentioned. The main or draft beams pass through the body transom and extend about 5 ft. beyond it. At both edges of the transom there are anchor plates riveted to the tops of the I-beams, these plates being about the thickness of the top bar of the transom; thus, with bolts through the I-beams and sills, the main beams are securely anchored to the car. In fastening to the end sill of the car a stirrup plate ½x 8 in. passes under the beams and up to the end sill, where it is secured with two bolts in either end, which adds strength to the sill. The forward ends of the four I-beams are also tied together by an angle bar 5x5 in., riveted to their top flanges, while immediately back of the angle bar a truss plate or stirrup is riveted to the outer beams through their top flanges and to the main beams through their lower

flanges, thus thoroughly trussing the beams against lateral strains.

The buffing force is transmitted to the car in a direct line with the longitudinal sills through a buffer spring 14 in. long and 5½ in. in diameter, which gives a range of motion sufficient to insure contact of the buffer plates under all conditions when the cars are coupled. The buffer mechanism also equalizes the force throughout the buffer face plate, so that it is practically the same at both ends when the cars are on a curved track, as well as on a tangent, thus preventing the outer ends of the buffers from separating when on curves. This equalizer insures constant contact of the buffers, as the compression of the buffer spring, necessary to couple the cars, is greater than the limit of compression of the draft springs.

As to the cost for maintenance and repairs of steel platforms, it has been found that this is between 2 and 3 per cent. of the first cost, and in the same way it may be noted that the similar charge for wooden platforms is between 25 and 30 per cent. of the first cost.

The value of the steel platform for preventing damage to cars in collision cannot be even estimated. It is possible that this is its most valuable feature. One instance of this kind was noted in our issue of May 13, where the Chicago Limited of the Pennsylvania Railroad, running at about 40 miles an hour, struck a work train. No one on the passenger train behind the tender was injured and there was no breaking up of any of the cars, although four were derailed. It was considered at the time that the steel platforms prevented telescoping and consequent damage.

Interchangeability in Locomotive Parts.

We reviewed at a great deal of length, a few weeks ago, that admirable work of Mr. Maurice Demoulin, the "Practical Treatise on the Locomotive Engine." It is unfortunate that a work so exhaustive and systematic cannot be translated into English. It seems particularly worth while, considering that interchangeability is now so much sought, to translate practically in full his remarks on that subject, and what follows is a free translation of that short chapter.

It is important that all the parts of a locomotive of the same type should be perfectly interchangeable, for reasons that it is not necessary to enumerate. This result is obtained in all good shops, and requires merely precision in adjustment, the least possible use of the file, the greatest possible use of the machine tool, and working to gage. This interchangeability concerns only the shop, but there is another sort even more important, which depends upon design; that is, the interchangeability of the principal parts, not only of engines of the same type, but of engines belonging to different series.

Nowhere has general interchangeability been carried so far as among certain English companies. Probably the eminent locomotive superintendent of the London & North Western, Mr. F. W. Webb, has been a pioneer in this matter. At first the aim was to secure interchangeability of axles, the carrying wheels, journal boxes and the minor fittings. Most of the English companies have a standard type of mechanism for the distribution and use of steam, of which all the parts (including the cylinders), may be applied to all locomotives, whether express, suburban, or freight. Others have gone even further and build but one type of boiler. This transformation has been brought about little by little, by destroying the old engines and creating a few types of new ones, called standards. This change was especially practicable in England because of the similarity existing between the freight and passenger service there, much of the merchandise freight being carried in light and fast trains. Interchangeability carried to this length presupposes that the locomotives assigned to the different services should be built to develop practically the same power, and that the driving wheel diameters should be so chosen that the piston speed remains practically the same for the different types. Among the advantages of this system are these: That the stamped parts of the boilers can be made by hydraulic presses with a very small number of dies, and that the shops can make up boilers and boiler parts as well as other engine parts at times when the work of actual building is slack. The cylinders are cast on a single pattern, and many pieces are made to gages of small variety, which insures exactitude of dimensions and rapidity of manufacture.

Two striking examples of the results obtained in England are in the locomotive equipment of the Lancashire & Yorkshire, and of the Great Eastern. At the end of 1895 the Lancashire & Yorkshire had 1,236 locomotives in service. Of these, 1,006 were of standard type; the other 230 were in service before Mr. Aspinall took charge.

The Lancashire & Yorkshire has only four models, namely, the express locomotive, with four-coupled drivers, of 87 and 72-in. diameter; tender locomotives, with four-coupled drivers, and freight engines with six-coupled drivers. Diagrams of these types are shown in Fig. 911.

In all these engines interchangeability is carried to the extreme length; they have the same boiler, except that the engines of the first series (express, with 87-in. drivers) have the tubes 38 millimeters (1.5 in.) shorter. The cylinders, valve motion, axles (straight and cranked), and all the fittings, are interchangeable and identical for all types. The same truck is used for all the passenger locomotives, and, in short, the only difference is in the length of the connecting rod and the diameter of the wheels. In these 1,006 engines of four different types, there is but one design of the following: Boiler (except as to length of tube, as mentioned above), fireboxes, cocks and gages, cylinders, steam chests, valve motion, axles, truck, truck springs, springs for carrying wheels and water tanks. There are four types of connecting rod, four of driving wheels, two of carrying wheels, two of cab and three for driving wheel springs.

The tender is of the same type for all, which is made possible by the free use of the water scoop. Consequently, any one tender can be attached either to the freight or passenger locomotives.

This system is employed to even a greater degree on the Great Eastern, which uses only five types of engine, shown by diagram in Fig. 912. Almost the only difference here is in the diameter and arrangement of the driving wheels and connecting rods and

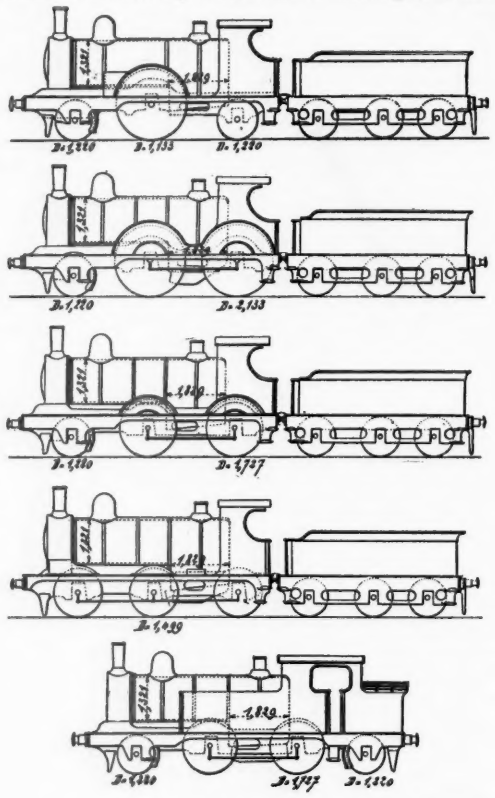


Fig. 912.—Five Types of Locomotives—Great Eastern Railway.

of the brake rigging and of a few small details. They have the same boiler, absolutely identical for all classes; the same cylinders, the same valve motion, the same axle boxes and identical attachments of all sorts.

The standard types are: High speed engine, with four coupled wheels 84 in. diameter; passenger engine for lines of heavier grade, identical with the above, except that the drivers are 68 in. diameter; high speed single driver engines with wheels 84 in. diameter, one pair of drivers being replaced by carrying wheels; suburban engine of "radial" type, on the same drivers as the passenger engine of the second type; freight engine, six drivers, coupled, 59 in. diameter. All of these engines, except the suburban engine, use one interchangeable tender.

Car Service Managers' Convention.

The annual meeting of the National Association of Car Service Managers was reported in "The Railroad Gazette" of June 3. The papers mentioned in that report were by J. C. Haskell, of Atlanta; W. M. Prall, of St. Louis, and J. E. Challenger, of Philadelphia.

Mr. Haskell discussed the question of demurrage controversies on cars carried over a line different from that shown in the bill of lading. Several cases had arisen in his territory in which the consignee, on being asked to pay demurrage, presented a counter claim for damages due to diversion. Mr. Haskell held that demurrage charges should be insisted on in such cases, thus forcing the railroads to be more careful in avoiding wrongful diversion, and the meeting agreed with him. It appears from the particulars given by Mr. Haskell that carload freight is often ordered by a roundabout route simply for the purpose of securing a low through rate, the shipper intending, at the time he sends the goods, to order them stopped off at some point short of the billed destination. How this can be done without illegal variation of tariffs is not explained.

The paper of Mr. Prall was an argument against allowing consignees to evade payment of demurrage charges by holding a car at one place 48 hours, and then ordering it to another yard, perhaps on another road, and there, perhaps, repeating the same trick. A charge for switching should be made, so that consignees cannot secure storage for nothing.

Mr. Challenger described the circumstances of a complaint made by the Pennsylvania State Millers' Association because grain, hay and potatoes are allowed 96 hours free time at Philadelphia while the allowance at other places is only 48 hours. It appears that the extra free time at Philadelphia is allowed for sampling the goods in the cars and making sales by sample at the commercial and produce exchanges. The controversy was argued before the Interstate Commerce Commission on Feb. 24. No decision has yet been rendered, but Mr. Challenger says that the roads made out a strong justification for their rule, and he expects a favorable decision. The principal railroads centering in Philadelphia took part in the discussion before the Commission, and the Car Service Associations of New Jersey, Baltimore and Northeastern Pennsylvania joined in the defense. It appears that the State Millers' Association, the members of which had received about 2,000 cars during the year last past, was able to show only $25 worth of demurrage bills paid during that time, representing an average of 1¼ cents per car per day.

Some Recent Pneumatic Tools.

Pneumatic hammers for chipping, calking, beading and riveting are now looked upon as an essential part of the equipment of boiler-shops, machine shops and foundries, and the demand has brought about a rapid improvement in these tools. The principal improvement has been made in simplifying the construction, many of the early hammers having delicate valve mechanism and these complicated parts were constantly breaking and getting out of order. In the more recent tools, also, the air passages have been enlarged and straightened and the recoil of the hammer has been reduced in different ways. Considerable advance has also been made in riveting tools by the use of a yoke in combination with a pneumatic hammer and with riveting machines of this type, which have only a fraction of the weight of the ordinary pressure riveter, 1¼ in. rivets can be driven.

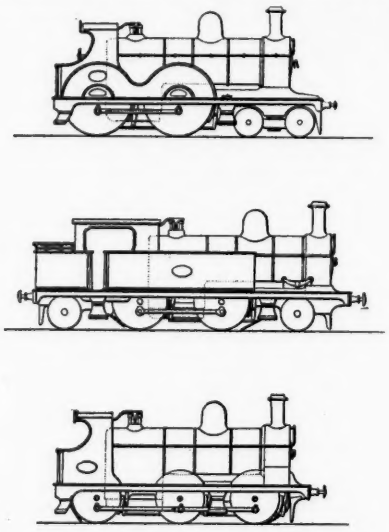


Fig. 911.—Three Types of Locomotives—Lancashire & Yorkshire Railway.

The illustrations give the main features of various pneumatic tools made by the Ridgely & Johnson Tool Co., Springfield, Ill. Fig. 1 shows a cross-section of one of the single hammers where B is a cylinder made of tool steel, and A a bronze handle, fitting over the steel cylinder, and attached to it by the steel nut F. E is a striking piston, the back end of which is larger in diameter than the main portion, forming a collar which fits the larger bore of the cylinder. The smaller diameter of the piston fits the smaller bore of the cylinder. The nut F is ratcheted along its outer edge, and held in place by the pawl M. D is a ferrule in the front end of the cylinder through which the tool is inserted and which is easily renewed when worn. The ferrules are made to fit either round or hexagon tools. K is a balanced throttle valve regulated by the lever G, and the hose connection is made at N.

The air passing through the valve K and the passage P enters the cylinder through the opening R. This fills the annular chamber T, and maintains a constant air pressure therein. The pressure upon the collar forces the piston back until the openings S, extending through the piston, are brought into communication with the chamber T. This admits air behind the piston, filling the space at its rear. The area of the piston being so much greater than that of the collar, the excess of pressure drives the piston forward against the tool which is inserted through the front end of the machine. The openings S are then

in communication with the air through the openings O, and the air behind the piston is thus allowed to exhaust. The pressure upon the collar again forces the piston backward and in this way the blows are rapidly repeated.

There is but the one moving part, the striking pis-

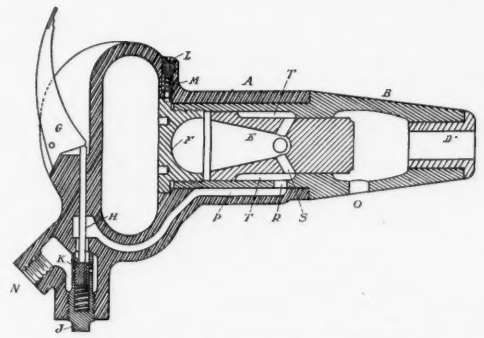


Fig. 1.—Single Pneumatic Hammer—The Ridgeley & Johnson Tool Co.

ton, which acts as its own valve, thus avoiding the use of delicate valve mechanism. The claims made for this tool are simplicity, high speed of working, and economy, as the air is used expansively. It is made in the following sizes: B, weight 14 lbs., for heavy chipping and riveting, will drive ½-in. hot rivets; CC, for heavy chipping, calking and beading,

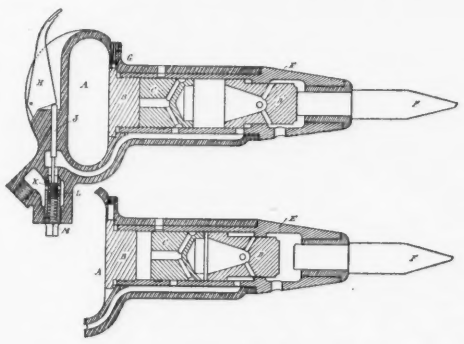


Fig. 2.—Counter-Balanced Pneumatic Hammer.

weight 11 lbs.; C, for medium chipping, calking and beading, weight 9 lbs.; D, for light chipping, calking and beading, and firebox work, weight 8 lbs. Size B requires ½-in. hose and ⅜-in. connections, while with the other sizes ⅜-in. hose and ¼-in. connections are used.

Fig. 2 gives two sectional views of the counter-balanced hammer with the striking and counter-balancing pistons in the two extreme positions. Comparing it with the cut of the single hammer, it will be seen that this is practically the same tool, with the addition of a second piston working in the opposite direction from the first. When the pistons are in the extreme end positions and start toward the center, the reactions balance each other, and likewise in starting from the middle position, there are no un-

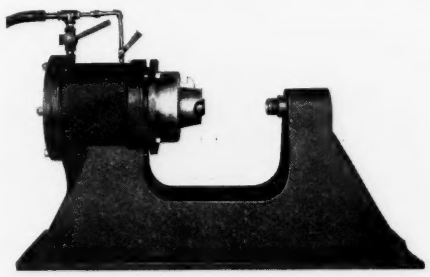


Fig. 4.—Stationary Riveter.

balanced forces until near the end of the stroke; at this time the energy of piston D is converted into work upon the tool, while that of piston B causes a backward reaction. This evidently is not so tiring to the workman as the alternating shocks of single hammers. The counter-balanced hammers are made in the following sizes: A, for very heavy chipping and driving up to ½-in. hot rivets, weight 12½ lbs; C, for heavy chipping, calking and beading, weight 12½ lbs. Both sizes requires ½-in. hose and ⅜-in. connections.

Fig. 3 shows the No. 2 yoke riveter, which has been found useful in ship yards, structural works, bridge works and car shops. The tool is much lighter than a hydraulic machine of equal capacity and it can therefore be operated with a smaller number of men and so do cheaper work. One man of ordinary skill and the rivet heater is all the force needed. In this machine a large single hammer is used and a pneumatic hold-on is securely fixed to opposite ends of a steel yoke. These yokes ar detachable, and special yokes for special work can be readily fitted to the machine. The yoke riveters are made in two standard patterns as follows:

No. 1, depth of yoke 12 in. Distance between dies wide open, 6 in. Will drive ⅞-in rivets. Weight, 84 lbs Pipe connections ½ in.

No. 2, depth of yoke, 16 in. Distance betweeen dies wide open, 6 in. Will drive ⅞-in. rivets. Weight, 84 lbs. Pipe connections, ¾ in.

The same hammers are also made with yokes, 6 ft. deep and over, of heavy iron pipe and hung in an iron bail. These machines are used in ship yards and are also adapted for erecting heavy stacks, water-towers, tanks, and similar work requiring heavy field riveting. Such tools will drive rivets up to 1¼ in. diameter.

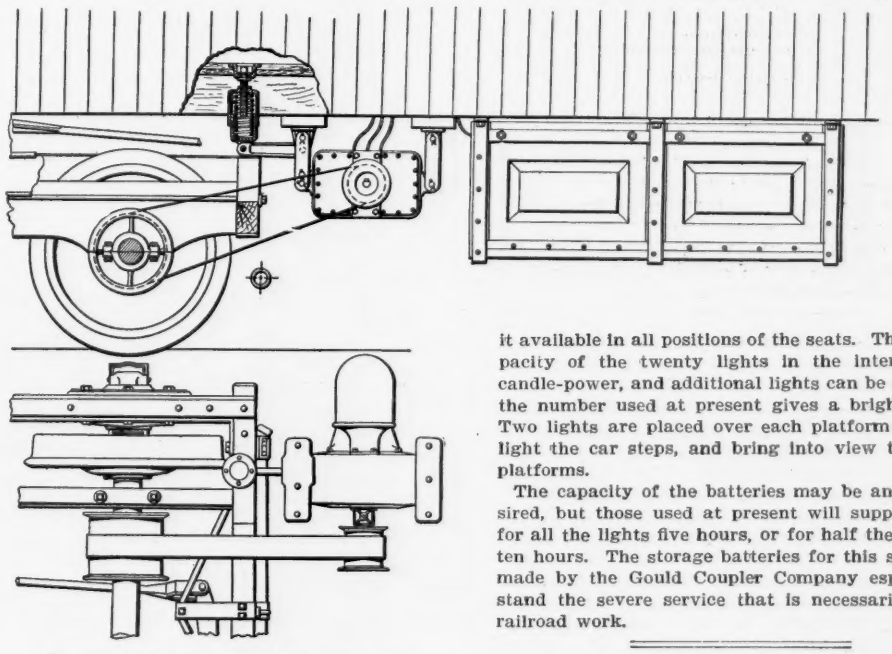
Fig 4 shows a stationary or stake riveter. These are made with a special plate-closing device in any depth of gap from one to ten feet; such machines also have a capacity for driving 1¼-in. rivets.

Gould Electric Car Lighting System.

While the lighting of passenger cars by electricity has not come into large use in this country, still a number of trains have lately been fitted with electric lights, which we have noted from time to time, and a good deal of experimental work has been done. The trains so far equipped have mainly been of the limited class, but there is evidence of considerable interest in this method of lighting, and its use is likely to increase. So far, the methods for getting current, which have been used to any extent, are, first, by the use of storage batteries, which are charged while the cars are standing at terminals; second, an engine and dynamo placed in the baggage car and run by steam from the locomotive boiler; and third, by generators under each car, which are driven from the axle. The greater part of the experimental work has been in perfecting the latter arrangement.

The Gould Coupler Company has now a number of cars in service fitted with axle-driven dynamos, which are said to be working satisfactorily. The system makes use of the English patents of J. Stone & Co., but in the Gould system the arrangement has been simplified and adapted to American practice. In a recent pamphlet issued by Stone & Co. it is stated that there are now upward of forty different railroads in the United Kingdom and Europe having cars lighted by its apparatus.

The engraving shows the application of the Gould system. A single set of storage batteries is placed in a box or casing, which, for ready access for inspection, is preferably placed under the car. A dynamo, of simple construction, is suspended from the underframing by an arrangement of links, so that it is free to move in a longitudinal direction. This movement is controlled by a lever, connected to the frame of the dynamo, which acts on a resistance spring, extending up through and even with the car floor. The action of this spring arrangement is to put a definite



The Gould Electric Car Lighting System.

tension on the belt running to the axle pulley, which tension is regulated from within the car by an adjustment of the spring resistance. Should the pull on the belt, owing to increased speed of running, exceed the weight on the belt, the dynamos will be drawn toward the driving axle, and thus allow the belt to slip while the armature continues to revolve at its normal speed. By this means the dynamo is adjusted to give any desired output within its capacity. Suspending the dynamo from the car body, it is claimed, avoids the excessive vibrations which would occur should it be mounted on the truck.

A split flange pulley is used on the car axle, which, as it can be adjusted to inequalities and different size axles, avoids the necessity of turning up the axle, and forms a convenient arrangement when wheels are replaced. An ammeter and a volt-meter, with two switches for operating the lights, are placed in a convenient position, preferably in one of the closets. These are the only appliances in the car, the ammeter indicating the current entering and leaving the batteries and the volt-meter indicating pressure. Two cut-out switches for controlling the lights are arranged to be operated by the ordinary gas key. This avoids the possibility of others than those having control of the system operating the light. An automatically governed switch on the dynamo shaft makes and breaks all connections from the dynamo to the lights and batteries. This switch acts at the normal speed at which it may be adjusted.

When the car is at rest, the lights receive current from the storage batteries, and in motion, after reaching a speed of 25 miles an hour, the automatic switch of the dynamo makes connection, and the

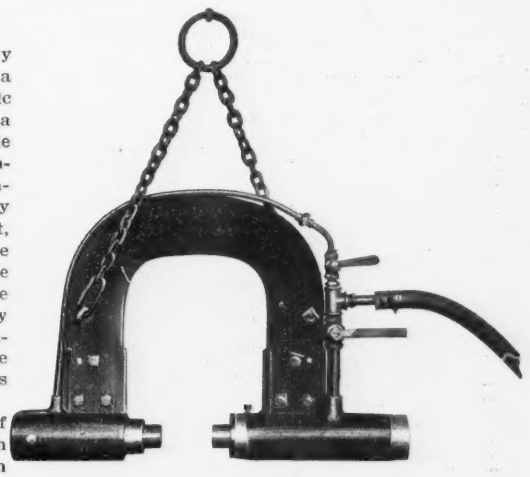


Fig. 3.—Yoke Riveter.

lights then receive the current direct from the dynamo, which also supplies additional, or surplus, current for recharging the batteries. When the speed decreases below the normal rate at which the automatic switch of the dynamo acts, it breaks the connection between the dynamo and the lights and makes the connection between the batteries and the lights. This automatic action is necessarily produced in either direction of the motion of the car.

The total number of lights used in an ordinary day coach is twenty-four 16 candle-power incandescent lamps. Twenty of these lights are placed inside the coach, and are equally divided on each side and suspended from the bottom molding of the deck sill. The distribution of the light is thus uniform, making it available in all positions of the seats. The total capacity of the twenty lights in the interior is 320 candle-power, and additional lights can be added, but the number used at present gives a bright interior. Two lights are placed over each platform to clearly light the car steps, and bring into view the station platforms.

The capacity of the batteries may be anything desired, but those used at present will supply current for all the lights five hours, or for half the lights for ten hours. The storage batteries for this system are made by the Gould Coupler Company especially to stand the severe service that is necessarily met in railroad work.

Standard Consolidation Locomotive.—Atchison, Topeka & Santa Fe Railway.

Below are particulars of the standard consolidation locomotive of the Atchison, Topeka & Santa Fe Railway. This type of engine was designed by Mr. John Player, Superintendent of Machinery, for heavy mountain service, and up to this time eight engines similar to the one described have been built at the Topeka shops, eight more are to be built during 1898 at the same place, and five have just been completed by the Dickson Manufacturing Co.

The boiler used is of the straight barrel type, and the firebox is wholly above the frames. The crown sheet is stayed from tee iron crown bars, which are suspended from the roof of the boiler. The main frames are cast steel, and the front rails hammered

iron. Steel castings are also used for such parts as pistons, cross heads, driving wheel centers, rocker and reversing shafts and frame connections; also for the frame, pedestals, equalizers and radius bar of the engine truck. In other regards these engines conform closely to the usual practice, as is evident from the following dimensions:

Consolidation Locomotive for the Atchison.

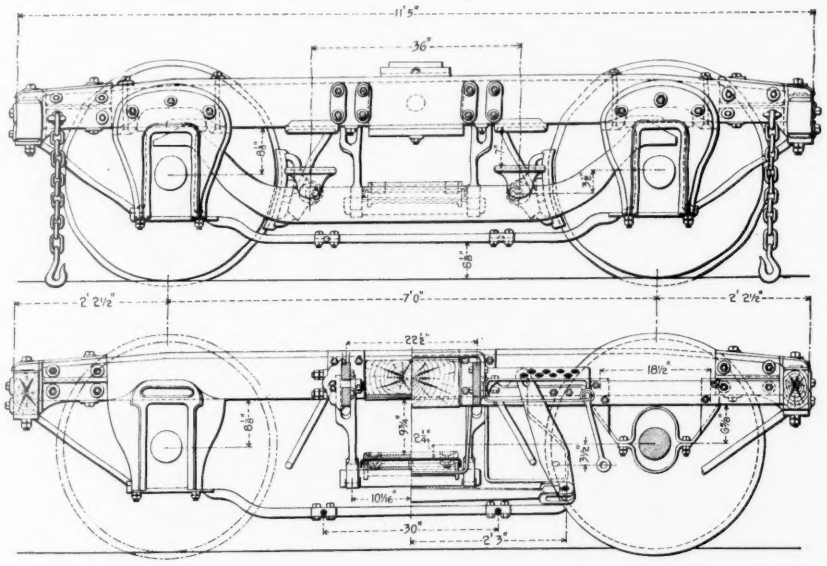
Fuel	Bituminous coal
Weight on drivers	143,500 lbs.
" " truck wheels	16,500 lbs.
" total	160,000 lbs.
Wheel base, total, of engine	23 ft. 3 in.
" " driving	15 ft. 2 in.
" " total (engine and tender)	57 ft. 10¾ in.
Length over all, engine	38 ft. 6⅜ in.
Height, center of boiler above rails	8 ft. 2½ in.
" of stack above rails	15 ft. 0 in.
Heating surface, firebox	153.5 sq. ft.
" " tubes	1687.15 sq. ft.
" " total	1840.65 sq. ft.
Grate area	29.23 sq. ft.
Drivers, diameter	57 in.
" material of centers	Cast steel.
Truck wheels, diameter	30 in.
Journals, driving axle, size	8x9 in.
" truck " "	5½x10 in.
Main crank pin, size	6x6¾ in.
Cylinders, diameter	21 in.
" rod, diameter	3¾ in.
Piston, stroke	28 in.
Kind of piston rod packing	Metallic.
Main rod, length center to center	10 ft. 3⅞ in.
Valves, kind of	Richardson balanced.
Boiler, type of	Straight barrel.
" working steam pressure	180 lbs.
" material in barrel	Steel.
" thickness of material in barrel	9/32, 5/16 and 11/32 in.
" inside diameter of barrel	66¾ in.
Seams, kind of horizontal	Sextuple riveted butt.
" " circumferential	Double riveted lap.
Thickness of tube sheets	7/16 in.
" " sides and back	5/16 in.
" " crown sheet	5/16 in.
Crown sheet stayed with	Tee iron, crown bars.
Dome, diameter	30 in.
Firebox, length	8 ft. 7 in.
" width	3 ft. 6 in.
" depth, front	62¼ in.
" " back	62¼ in.
" material	Steel.
" thickness of sheets	3/8 and 5/16 in.
" brick arch?	No.
" water space, width:	Front, 4 in.; sides, 4 in.; back, 4 in.
Tubes, number	233
" material	Charcoal iron.
" outside diameter	2 in.
" length over sheets	13 ft. 10 in.
Smokebox, diameter	68 in.
" length	65 11/16 in.
Exhaust nozzle, single	Permanent.
" " distance of tip below center of boiler	1 in.
Netting, wire, mesh	2x2 in.
Stack	Taper.
" least diameter	15⅜ in.
" greatest diameter	18⅜ in.
" height above smokebox	3 ft. 11 in.
Tender	Swivel trucks.
Tank capacity for water	5,000 gals.
Coal capacity	7 tons.
Material in tank	Steel.
Type of under-frame	Steel.
Type of truck	Diamond frame.
Truck with	Swinging motion.
Type of truck spring	Coil.
Diameter of truck wheels	33 in.
Diameter and length of axle journals	4¼x8 in.
Type of truck bolster	Player, cast steel.
Type of truck transom	Player, cast steel.

Names of Makers of Special Equipment.

Truck and tender wheels	Boies.
Sight-feed lubricators	Nathan Mfg. Co.
Safety valve	Crosby Steam Gage & Valve Co.
Injector	Nathan Mfg. Co.
Driver brake equipment	American Brake Co.
Tender brake equipment	Westinghouse.
Driver brake shoe	Ross-Meehan.
Piston rod packings	C. C. Jerome.
Valve rod packings	C. C. Jerome.
Feed water heaters	Rushford.

The Pennsylvania Standard Passenger Truck.

The engravings show the standard 4-wheel truck for passenger cars, recently designed and issued by the Pennsylvania Railroad at Altoona. The drawing was issued Jan. 24 and reissued April 21, having been redesigned to suit the 4¼x8 in. M. C. B. axle. The engravings show the design and dimensions so fully that description is unnecessary.



Pennsylvania Railroad Standard Passenger Truck—Issued April 21, 1898.

The Works of the Schoen Pressed Steel Company.

[With an Inset.]

The growth of the works of the Schoen Pressed Steel Company has been so great within quite recent years and the work that they are doing has become so important in car building, that it seems particularly appropriate to give at the time of the Master Car Builders' convention some account of those works and illustrations of the works themselves and of the product turned out. The plant of this company is situated on the Ohio River in Allegheny City, Pa., about 20 minutes by trolley car from the heart of Pittsburgh. The works cover about 24 acres and employ 1,500 men, with a capacity for turning out 15 finished steel cars a day, besides a large quantity of pressed steel specialties for wooden cars. New buildings are now erecting, and the additions are made along systematic lines with a view of soon developing an establishment capable of turning out 50 finished cars a day. At present the works consume about 300 tons of steel plate every day. The capacity for pressed bolsters alone is over 500 a day. The truck department has a capacity of 200 trucks a day, and trucks of two standard types are made, each in 60,000 lbs., 80,000 lbs., and 100,000 lbs. capacity. These two types, the diamond and the pedestal, are shown in perspective on the inset herewith.

The great variety of shapes produced, which include all the parts of complete steel cars of two quite different patterns, and include also complete steel trucks of different patterns, besides bolsters, center plates, stake pockets and a great number of small parts for wooden cars, employs by necessity a large variety of tools and processes. As a result, one necessary feature of the establishment is its inspection bureau, with two or three inspectors for each different department and for its various divisions, such as pressing, punching, fitting, riveting, etc. Another result of this great variety of product is that the men who are employed at the works must be trained there; that is, the mechanics cannot be picked up in the market as a staple commodity.

We may divide the work as a whole into two grand divisions, the steel car division and specialties for cars, both steel and wooden. These are subdivided into a shearing department, a small pressing department, several punching departments where different classes of work are done, various riveting and fitting departments, and finally, the painting department. Incidental to these is a large templet and pattern shop where the templets are made for punching the various shapes, as well as patterns for the dies used on the presses. There are also the machine shop, blacksmith shop and carpenter shop.

Doubtless the largest hydraulic plant in the United States is established at these works, perhaps the largest in the world. Hydraulic power runs all the presses and the riveting machines. There are two centralized hydraulic stations, one contains two large duplex, Laidlaw-Dunn-Gordon, high-duty, steam pumps, steam cylinder 28 in., water 7¼ in., and 18 in. stroke. With these is a battery of six boilers, four fire tube and two sectional boilers. In this station is also a Buckeye steam engine, used in running the machine shop and the small punching department.

In the main power house are two more pumps exactly like those in the other station. Pipe lines run all over the plant, and the main lines lie in a brick trench, which is readily got at, and gives the workmen every advantage in making a high pressure hydraulic joint. In this power house are three direct connected engines and dynamos, one of 100 kilowatts, and two of 50 kilowatts, used in running the overhead electric traveling cranes, of which there are ten Shaw cranes of 5 tons capacity and 60-foot span; and in generating the current for lighting. There are here a 100-H. P. Buckeye engine, an Ingersoll-Sargent air compressor, duplex and one of their largest type, used in running the reamers, chippers, etc. Also in this power house are the ordinary heaters, switchboards, small pumps, etc., and behind it is a battery of boilers somewhat similar to the battery already mentioned. In the power equipment is included a locomotive, used for handling and switching cars, and a locomotive crane of 10 tons capacity at 12 ft. radius, with a reach of 30 ft.

In the shearing department we find a large number of shears of various sizes—one that will cut a plate 1 in. thick and 100 in. long at a single stroke. As the pieces pressed are all sorts of finished shapes, many of which cannot be sheared after pressing, the form of the blank sheet involves special knives in shearing. From this some idea of the amount of shearing may be guessed, when almost every piece is sheared to the correct shape before it is pressed, and cannot be sent back again to the shearing department for final trimming.

From the shearing department the work is carried into the pressing department. Here a great variety of presses may be seen, two enormous presses exerting a pressure of 750 tons, several from 400 to 600 each, down to small presses exerting from only 50 to 60 tons each. Here also is a large number of drop steam hammers, which do a certain class of work better than presses. Let us watch one of the small presses. Out of the furnace—which is always the necessary accompaniment of the press—comes a red-hot plate of steel; not an ordinary rectangular plate, but one that, perhaps, is cut in on the sides and ends looking like a Maltese cross. The press men lift this into place on the die with tongs, the press comes together and squeezes the steel between the two halves of the dies, into a box-shaped piece. This is a simple shape, some are very complicated and very difficult to press. Much depends on the heat of the steel, the quality of the steel, the clearance of the dies, and various conditions which it would be very difficult to classify.

Again, we go to one of the large presses, where, perhaps, a car bolster is being pressed. Here, when the red-hot blank, weighing 700 or 800 lbs., comes out of the furnace, the same ease of handling is not found as in the small presses. Various devices of jib cranes and shovels are used, and in these large sizes the difficulty of not tearing the steel is much greater. Also, allowing for the expansion and contraction of the die as well as the steel piece itself is no easy matter.

In the same building with the shearing department and the very large presses is one of the large punching departments. This building is 120 ft. wide, containing two crane runways, two cranes on each, and is about 550 ft. long. These cranes carry the work from the shears to the presses, and from here to the punches.

In the punching department are all sorts of devices for punching. Many of the ordinary punching machines may be seen, some equipped with gang punches and some of the presses are rigged up to punch a piece complete at one stroke; there being sometimes as high as 25 holes punched at once. Also, large holes

are punched out in this way in various odd shapes. All the holes are laid off by the ordinary templet system used in bridge building, but on account of the shape of the piece the templets are sometimes of a very peculiar shape.

On one side of the building already spoken of is a steel building not quite as long, running along the street, and on the other side are two buildings which are about 600 ft. long. One is 70 ft. wide, containing two cranes on its runway, and the other is 120 ft. wide, by 600 ft. long, containing two runways and 4 cranes. All these are electric cranes already mentioned. The smaller building contains the fitting and riveting departments, for the trucks and specialties. In the large building the cars are erected. Among the riveters may be seen a large variety of machines, especially designed to suit the peculiar work they have to do; several large ones with an 8 ft. gap, a large number of smaller machines and various types of suspended riveters.

Leaving this fitting department and going into the car department, one sees rows of cars across the shop. Each row is in a certain stage of erection. When the car body is ready, the cranes lift it up as a whole and place it on the trucks, which are run in on the tracks beside the car. The sides and various other parts of the car are put together as a whole, and riveted before being sent into the erecting shop. Cars are then taken out into the paint and testing shops, which are about 200x400 ft.

The products of the company are its own design almost entirely, and such as to secure the best and most economical results; with this in view, care has been taken to avoid driving rivets by hand wherever possible.

The development of the Schoen establishment is quite wonderful when one considers that all of the various products have been designed and exploited by the company. In other words, the product of the Schoen Pressed Steel Company is really a new industry, and it opens up a field vast in its possibilities.

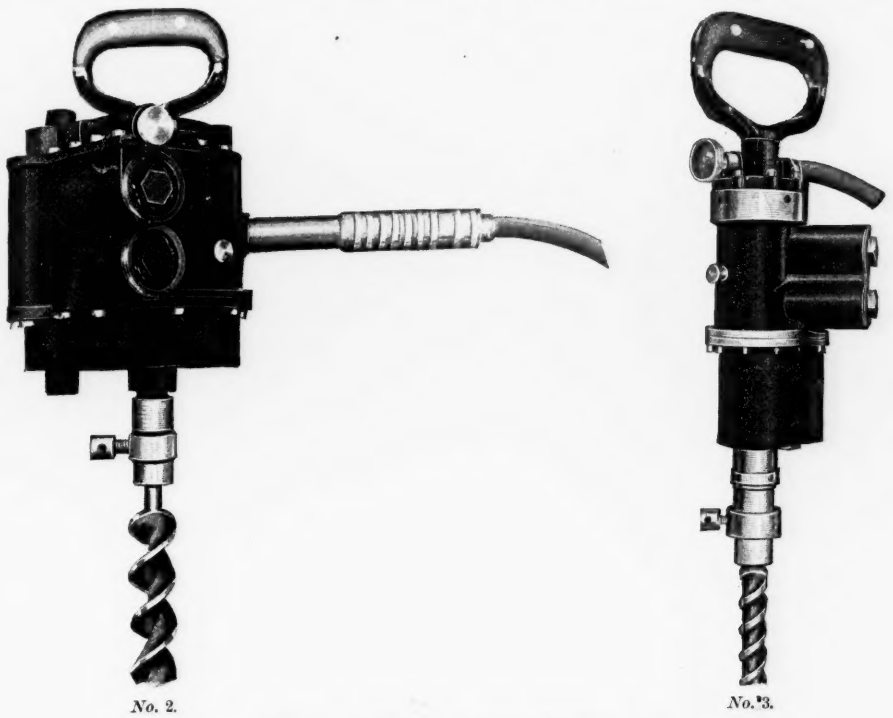
Pneumatic Boring Machine.

The Standard Pneumatic Tool Co., Chicago, is selling a pneumatic boring machine, called the "Little Giant," for such work as passenger and freight car building and repairing, although it can be used for drilling as well. In the illustrations Fig. 1 shows the No. 2 and No. 3 sizes, while Fig. 2 shows the machine in use, giving an idea of the class of work to which it is adapted.

These tools all have piston valves set to cut off at five-eighths of the stroke, and, as the exhaust does not come in contact with the gearing and other moving parts, such parts are encased and run in oil. The No. 1 machine weighs 20 lbs., the No. 2 18 lbs., and the No. 3 8 lbs., and these will bore holes up to 3 in. in diameter, 2¼ in. and 1 in. respectively.

There are four single-acting cylinders arranged in pairs, the pistons of each pair acting on cranks set at 180 deg., while the cranks of one pair are set at 90 deg. with those of the other pair, so there are no dead centers. The crank shaft is of hardened steel and fitted with removable bronze bearings. The drill spindle is independent of the motor casing, and likewise supported in bronze bearings, and its head is provided with a screw for forcing the drill out of the socket, making it unnecessary to use a drift pin. One handle has a connection for the air hose and contains a throttle valve, which, by turning to the right or left, controls the air supply and regulates the speed. The No. 3 machine has a changeable gear, which allows high speed for boring small, and slow speed for boring large holes.

The principal claims made for these tools are simplicity, economy in the use of air, and smooth running.



No. 2. *No. 3.*

Fig. 1.—"Little Giant" Boring Machines.

Car Inspection.

In our issue of May 6 extracts were given from a paper entitled "Car Inspection," presented before the St. Louis Railway Club by Mr. Charles Waughop, Chief Joint Inspector, East St. Louis. This paper was discussed at the May meeting of that club, when Mr. S. D. Webster of the Terminal Association stated that the best record of the St. Louis inspectors was 32 cars in 57 minutes.

Mr. J. R. Groves, Superintendent of Machinery of the St. Louis & San Francisco Railroad, said: "It is a very unusual thing, notwithstanding that cars are inspected in a hurried manner, to have an accident on account of a car in an unsafe condition passing an inspector. It is a fact that car inspectors have become so expert in their particular line that they can tell almost at a glance as to whether a car is in sufficiently good condition to pass or whether it should be shopped for repairs, and it is a very rare thing to have them make a mistake in its condition. I believe that I am safe in saying that the same rapid strides have been taken in the direction of car inspection as in other branches of railroad service.

"One thing, I think, should not be lost sight of, and that is that the joint inspector is not absolutely the fellow who is giving us all of the efficient service we are getting to-day. It is true, no doubt, that the joint inspector has very largely influenced legislation on the matter of interchange of cars, but the facts are that the M. C. B. rules of interchange are responsible for the rapid transaction of business throughout the country. The wisdom of the Master Car Builders' Association has come very slowly, and it is a fact that there is so much at stake that they are inclined to be a little conservative and stick to the old plan rather than attempt something new, and it is only after long years that the present admirable system has been brought out."

In speaking of standard parts and the standard freight car recommended in the paper under discussion, Mr. J. A. Carney, Master Mechanic of the Chicago, Burlington & Quincy Railroad, said: "So far as I am able to see, the freight car is just as much of a curiosity to-day as it ever was. Each master mechanic seems to have his own idea of what the proper truck should be or what should be the proper body of the car, and while one man has one kind of a door-hanger another man has another kind, and especially is this the case in the matter of M. C. B. couplers.

"Some time ago we had a car set out for want of a knuckle. It was a knuckle that I had never seen before, and nothing of the kind had been seen on our road. It was then suggested that each way car be fitted up with a complete set of standard M. C. B. knuckles, so that whenever we had a case of breakdown on the road we would have an extra knuckle to replace the broken one, but we found that our surplus was not large enough to warrant us in buying as many knuckles as we would require.

"It seems to me that we are as far away from the standard to-day as we ever have been, and I, for one, would be very glad to see a standard freight car adopted and lived up to, the same as the standard air brake. It would mean a great deal of time and money saved and would save much correspondence when a case of wrong repairs comes up."

The Locomotive as a Machine.

Mr. Demoulin's recent work on the locomotive ends with a couple of pages of general conclusions which we translate in full.

The locomotive engine is the most direct method of using steam for hauling vehicles on a railroad. It gives almost always the maximum of economy, is made up of the minimum number of parts, is self-contained and unites in itself, in the highest degree, the conditions which assure the public service, without interruption; it is in fact a very perfect machine. It has been the object for more than half a century of the conscientious study of many able engineers and builders, and represents in its most modern form a collection of arrangements as simple as they are ingenious and an almost perfect adaptation to the work to be done. It has great elasticity, is light, powerful, simple, robust and cheap in first cost and in maintenance.

Fig. 2.—No 2 Pneumatic Boring Machine in Use.

When well designed and cared for the locomotive engine will develop one indicated horse-power for 1.3 kilograms (2.9 lbs.) of coal and the consumption is often brought down to 1.15 kilograms (2.5 lbs.). As the engine is coupled directly to the drivers, the transmission of power is the simplest possible and the mechanical return is high. The well-known causes of its efficiency are the same as those which unite to make the locomotive a compact and light motor. The high piston speed minimizes the internal losses, while the small volume of the boiler and the compact arrangement of the steam using parts reduces to a minimum external losses by radiation. The combustion is very active and the utilization of the heat is good.

It is often said of the locomotive that it is subject to motions which are injurious to track and machinery, and which give a certain serious instability, and which necessarily follow from the alternating reciprocating movements at high speed. While all this was formerly true, it is no longer true of well built and well designed modern locomotives. The diminution of the overhang, the lengthening of the wheel base and the common use of a leading truck have, little by little, diminished the importance of these objections. Furthermore, it is possible to balance quite perfectly the reciprocating parts by the use, for example, of four cylinders, and this arrangement will probably be extended in the future.

The locomotive is one of the lightest of motors. Thanks to its compact arrangement, to its high piston speed and to the intensity of combustion, it can develop say 20 horse-power per ton of weight (tender not included) and there is no evidence that the limit of its capacity in this way is reached. The first cost per horse-power is perhaps about 75 francs ($14.30).

While perhaps it was once assumed that the limit of the power of the locomotive was nearly reached, recent practice has shown that this is not true. The limit was put further away when men got over their fear of raising the center of gravity. By putting the boiler high enough the volume of firebox and boiler can be increased, regardless of the length of axle

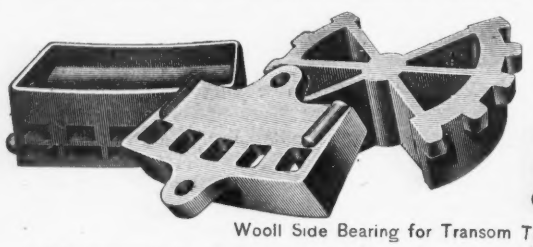
and diameter of driving wheels. In recent times the Americans have put into service for standard use locomotives with a grate surface of 8 sq. meters (86 sq. ft.), boilers of 1.9 meters (75 in.) diameter and a heating surface of 280 sq. meters (3,014 sq. ft.). Locomotives of like power will be built in Europe when they are needed.

The locomotive is susceptible of still further improvements, but it is not desirable to seek these by exceptional or complicated arrangements. The prime qualities always to be aimed at in the locomotive are simplicity, compactness, endurance and lightness. In other words, in all locomotive improvements, we should not occupy ourselves too closely with special points or put out of sight the general characteristics to which all others should be subordinated. I hope that I have demonstrated in this book that the locomotive, far from being an antiquated machine confined within narrow limits, is really a very perfect machine, an instrument simple and economical and admirably adapted to the work required. These facts, it seems to me, should be often repeated nowadays.

The Wooll Side Bearing.

The accompanying engravings show the Wooll side bearing, which can be used with either a rigid or swing bolster truck, the double quadrant shape being used with transom trucks where the bottom is secured between the transom channels and as near the side frames as possible. The usual practice has been to design the bolster to carry all the load of the car body through the center plate to the truck bolster and provide a clear space at the sides, but it is now pretty well demonstrated that it is not practicable to keep the side bearings clear without resorting to very heavy bolster construction. In the Wooll bearing it is intended that the load shall be distributed between the center plate and the two side bearings, and a cast iron quadrant is therefore introduced between top and bottom bearing plates, so as to substitute rolling for the usual sliding friction; with three points of support the bolsters need not be made so heavy.

These quadrants have faces sufficiently wide to



Wooll Side Bearing for Transom Truck.

safely transmit the loads without failure by crushing, while a row of teeth on each quadrant engages a short rack cast in the corresponding plate, the teeth being simply intended to insure a positive motion when the cars pass around curves. In curving the quadrants travel in an arc of a circle concentric with the point about which the truck turns.

This side bearing was but a short time ago put on the market by Mr. S. W. McMunn, Old Colony Building, Chicago, and already there are a number in use.

The "Solid" Coupler.

The Michigan Malleable Iron Co., Detroit, is introducing a new coupler called the "Solid," the principal features of which are shown by the engravings. Fig. 1 is a horizontal section when the parts are coupled. Fig. 2 shows the uncoupling position, and Fig. 3 the lock and knuckle in the coupled position. The draw bar is malleable iron, and the knuckle cast steel. The lock is a four-sided pin with 12 sq. in. bearing surface on the wall of the coupler, and a 5½ sq. in. bearing on the arm of the knuckle. The pin must be raised 4 in. before the knuckle is released, which is a greater vertical movement then is usually provided and because of this feature it is claimed the parts will remain coupled in service. The opening in the coupler head is made to conform to the surface of the knuckle arm, and the horn at the rear of the knuckle is made of sufficient strength to transmit the entire pull without the aid of the pivot pin. The pin is prevented from turning by a cotter which is recessed in the lugs at the coupler head, so that the wear will come on the pin and knuckle. By raising the pin to the position shown in Fig. 2, it is set for uncoupling, which is a convenient feature for switching cars. When the knuckle is open, the parts are always in position for coupling.

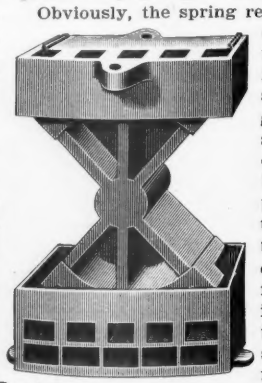
The Westinghouse Friction Draft Gear.

The Westinghouse friction draft gear and buffer is shown this year at the Conventions with several distinct improvements, although in general it is unchanged. The substitution of a yoke for a tail-bolt has facilitated some changes of detail, the necessity for which had been shown by past experiments, and in the present standard form of the buffer the yoke only is used. The wedge block, which will be more particularly explained later, is now faced with a very hard brass, to avoid the corrosion which had been one of the difficulties in the earlier form. An auxiliary release spring has been introduced, the purpose of which is to drive the wedge block back and so facilitate release, which has been made possible by the use of the yoke instead of the tail-bolt. Furthermore, the grooves, L, in the carrier segments, B, have been made of four different lengths, which again facilitate the release, as will be explained further on.

A brief description of the parts of the buffer as now made up follows: The cylinder, A, is of malleable iron and is 17⅝ in. long. In this are 16 V-shaped grooves, in which engage the sixteen friction strips, $8\frac{9}{16}$ in. long, of wrought iron, case hardened. These strips are arranged around a cylinder loosely made up of eight segmental carriers, B, which are made of malleable iron. On the inside of each of these carriers is a beveled surface, and when the carriers are assembled these beveled surfaces form a hollow frustrum of an octagonal pyramid. In this space works the octagonal wedge block, D. This wedge block is made of cast iron faced with brass, as before explained, and is carried loose on a spindle called the release pin, E. There are three springs; the preliminary spring, F, with a capacity of 16,000 lbs.; the release spring, G, of 25,000 lbs., and inside this the auxiliary release spring, H, of 7,000 lbs. The ends of these springs are ground true, and the dimensions of all parts are such that the springs can not close down.

In buffing, the thrust is taken first on the head of the cylinder, and is carried back through the release spring, the carrier segments, the wedge block and the preliminary spring, to the follower.

Obviously, the spring reaction on the wedge block spreads the carrier segments, and these in turn force the sixteen friction strips into the Y-shaped grooves in the cylinder, and so the backward movement of the cylinder is retarded by the friction of these parts. These segments bottom on the follower before the springs are entirely closed down, and then the friction of the friction strips in the grooves of the cylinder is the principal resistance to further move ment of the parts. The greater the thrust of the spring on the wedge block the more the friction between the friction strips and the grooves in the cylinder. The smaller the angle of this movable wedge block the greater the outward pressure on the carriers and friction strips, but also the greater the difficulty of release when the draw gear is again put in tension. That angle has been a matter of experiments. As the apparatus was used last year it was 38 deg.; now it has been reduced to 30 deg.; that is, the angle between two opposite surfaces produced.

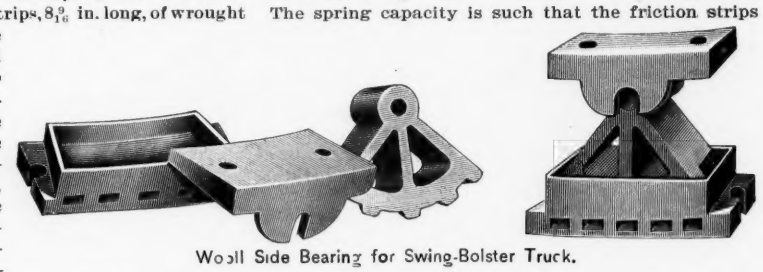


The sum of all the resistance of the springs and the friction strips is about 170,000 lbs., as shown on the hydraulic press; that is, it takes this, or somewhat more or less, to complete the motion of the movable parts under the slow operation of the hydraulic press. Under the conditions of a train, the buffing arrangement can account for a force a good deal larger than would be represented by these figures.

When the train is pulled out and the parts are again put in tension, the first thing that happens is the action of the auxiliary release spring on the release pin. This pin projects about an eighth of an inch back of the rear end of the segments, and consequently when the apparatus is closed down and the follower is in contact with the rear end of the segments, the tension of the auxiliary release spring is taken entirely off the wedge block. In pulling out, as we have said, the first thing to happen is that the auxiliary release spring acts on the wedge block, forcing it back and relieving the segments from the wedge action. The main release spring acting on the segments begins to disengage them, but here comes in a very ingenious and useful modification, introduced within the year. We have said that the grooves in the segments in which the lugs on the friction strips engage are of different lengths. In fact, there are four different lengths, varying by $\frac{1}{16}$ of an inch. The consequence is that the friction strips are picked off in groups of four, and the release spring has to act against the friction of only four of these strips at a time, thus making more certain their actual disengagement from the grooves in the cylinder.

The failing point in former arrangements of this buffing device has been that it did not release certainly. Obviously, if it becomes jammed it is of no more use than a solid drawbar. In the earlier forms a pretty large percentage of the buffers declined to release. There are now about 600 of the earlier form of the buffers in use on the steel cars of the P., B. & L. E. R. R., and 200 of the latest improved form are in constant use there also. We believe it is true that with this latest form no failures to release have occurred.

We have described the action of the apparatus in buffing and its release. Its function is not alone as a buffer, however, and it is called a friction draft gear. In hauling the pull on the strap is taken on the follower and so transmitted through the springs to the head of the cylinder and thence to the draft sills. The spring capacity is such that the friction strips



Wooll Side Bearing for Swing-Bolster Truck.

are called upon for but little work in the ordinary hauling of the train, although they are constantly engaged.

The performance of this gear is to be considered from two quite distinct points of view: Its duty as a buffer in stops and in yard work and its duty while the train is in motion.

Obviously, the ideal buffer for both of these duties is one that will absorb the energy of the moving mass and dispose of it so that there will be no recoil. The spring buffer cannot do this for reasons that are sufficiently apparent. Unless we can lock the spring in some way it is bound to react with the greater part of the energy that has been put into it in compressing. We have seen this well-known fact illustrated many times in the yard, on service runs, and in brake experiments, until it has come to be known as a matter of actual experience, even to trainmen and yardmen. It is well recognized that a spring buffer can be used to account for but little of the energy in the moving mass, because of the recoil, and if the springs were made strong enough to be really useful in protecting the draft gear, the sills and other parts, the recoil would tear trains to pieces. Nobody would expect to dispose of the recoil of a great gun on shipboard by springs; if he did his guns would probably be thrown out of the ship the first time they were fired. Obviously, a buffer acting by weights as in a disappearing gun carriage cannot be used on a railroad train. Probably hydraulic buffers will be found impracticable, although it is not impossible that the ingenuity of man will some time get up a hydraulic buffer that can be worked under railroad conditions. Now, however, the only thing in sight is a device which will dissipate the energy of the moving masses through the intervention of friction, and the only device of this sort that has been brought to a point of working development is the one which Mr. Westinghouse has been perfecting through many years of study and experiment.

It is probable that the further duty of this friction draft gear in taking care of the alternating strains of buffing and pulling which take place while the

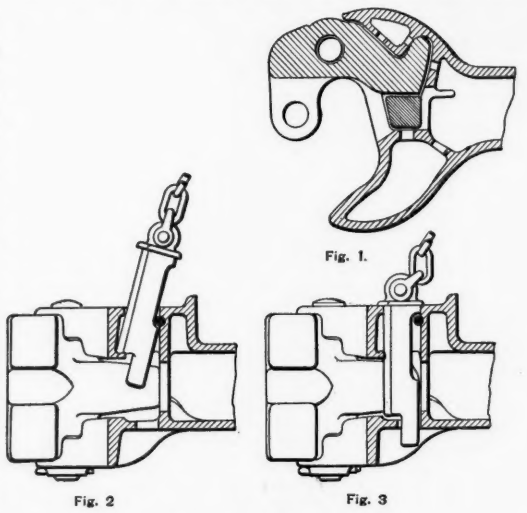


Fig. 1.

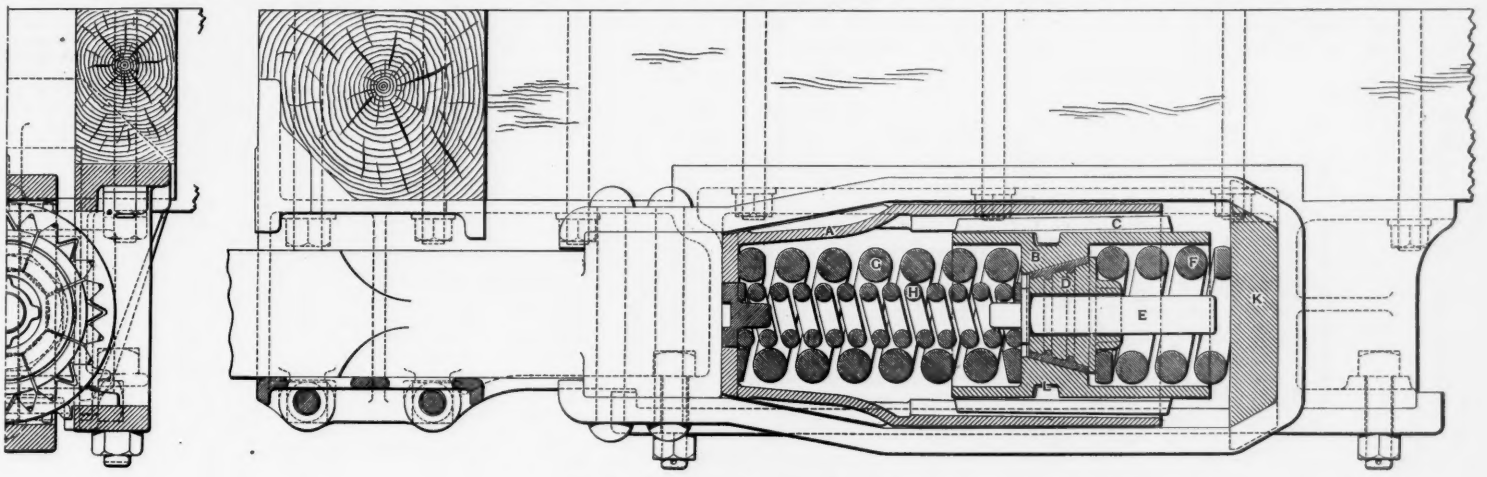
Fig. 2 Fig. 3

The "Solid" Coupler.

train is in motion on the road has not been sufficiently considered by any one unless it is by the few men who have been carefully studying the subject. Under such conditions of grade and track as all railroads encounter to-day, and as almost all railroads will probably encounter for many years to come, there must be constant alternations between compression and tension throughout the train. As the engine is slackened or as the train runs down grade the cars run together. Then, without stopping, the train is again stretched out. If now the recoil of the buffer springs is brought into play concurrently with the forward motion of the masses of the locomotive and the leading cars a set of conditions is established which is very favorable to a break-in-two. It is easy

to see that by the use of a device working on the principles of this friction draft gear these alternating strains will be largely taken care of.

It is hardly necessary to go further to point out the great advantages to come from the action of such an ideal buffer as we have had in mind up to this point in the discussion. In the first place the immediate damage and destruction to rolling stock due to the heavy buffing strains in yards and due to the breaking in two of trains on the road would be largely eliminated. In the second place, the constant racking of the parts and necessary wear would also be largely eliminated. Thus we might naturally expect a great saving in the repair account, for it is a matter of common knowledge that the greatest item of car repairs is in the draft gear, and in damages due to defects and failures of the draft gear.



The Westinghouse Friction Draft Gear.

Now the question arises, does this perfected friction draft gear do what we have supposed the ideal buffer might do?

We have said above that there are about 600 of these gears, under the form which was shown last year, at work on the steel cars of the Pittsburg, Bessemer & Lake Erie. There are also some 200 of the latest improved type at work there, and this will be substituted for all of the earlier 600 as fast as possible. There are also a number of these buffers in service in a small experimental way on various other cars, particularly on a Frick coke train of 40 cars, where they have been in use for two years. There are others in use on the Schoen cars on the Pittsburg & Erie, and on the Pittsburg & Lake Erie. These, being of the less perfect type, have not acted as well as the latest buffers put out; that is, a considerable percentage of them have given trouble by jamming and remaining closed. Nevertheless, even this less perfect form of the apparatus has shown a vast superiority over anything that has ever before been tried. The 40 Frick coke cars have been kept steadily at work in a solid train by special arrangement, making three trips a week between the mills and the coke ovens. The rapidity with which they can be handled over the scales because of the greater speed practicable in running them together, the ease of riding and steadiness of motion have all been thoroughly well demonstrated to everybody who has had to do with the train or has had a chance to observe it.

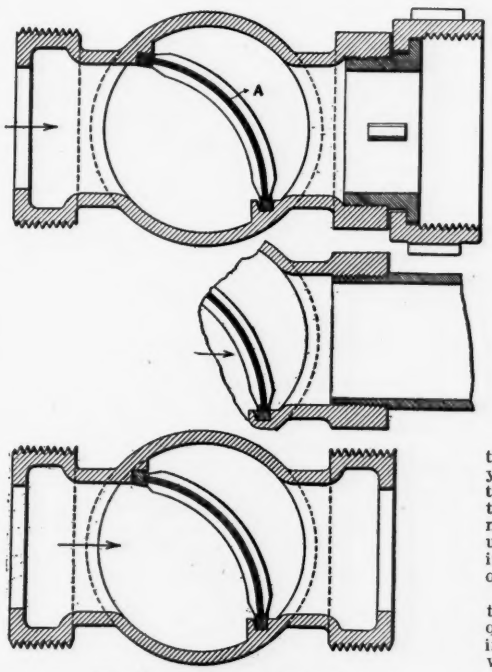
On Friday of last week we saw a number of experiments with a train of 33 of the Schoen steel cars of 100,000 pounds capacity, loaded with 1,650 tons of ore, running on the Pittsburg, Bessemer & Lake Erie Railroad. The train was cut in two back of the tenth car from the engine and then run together, first at about five miles an hour, and again at about eight miles an hour. The buffing shock of a train of such a weight at a speed of eight miles an hour will be appreciated by every railroad man. With ordinary cars and buffers one would expect considerable damage. In the experiments observed the buffers closed smoothly and quietly and there was no recoil.

Emergency stops were made with the same train from speeds of about 25 miles an hour, the train being equipped throughout with a quick action brake, and an emergency stop was made with the same train with the brakes on the ten cars in the rear cutout. The smoothness of these stops and the entire absence of shock were wonderful. The train came quietly to rest and it took a pretty acute observer to tell when the brakes went on.

The riding of the train was equally remarkable. It was like a train of Pullman cars. This, of course, was due to a good many things. The new, strong cars, heavily loaded, were carried on new steel trucks of the Vogt pattern, and naturally, one would expect them to run quietly and smoothly. But the constant action of the friction draft gear was very apparent as an important element in this running to anybody who sat where he could carefully watch the couplers as the train was in motion. There was a very slight and slow and gentle movement of the drawbars in and out, but neither on the train nor on the engine could one recognize any surging or jerking.

The Hancock Hose Strainer.

The hose strainer illustrated was designed by the Hancock Inspirator Co., Boston, Mass., for the suction pipes of locomotive inspirators and injectors. It consists of a perforated copper plate, A, in a metal frame, which fits into slides in the body. By removing the tapered key, B, the bonnet can be easily taken off and the copper plate removed and cleaned. The bonnet is fitted with a ground joint, and the seat is so located as to be protected from damage. The perforated plate rests at such an angle that coal or other sediment from the tank will drop below the plate and not interfere with the waterway. These strainers are made right and left, one end fitted for the size of hose coupling used, while the other end is made to fit standard sizes of iron and copper pipe, as desired. The engraving shows three ways for making these connections.



The Hancock Hose Strainer.

Niagara Falls Meeting of the American Society of Mechanical Engineers.

The Niagara Falls meeting of the Society held its opening session in the convention parlor of the Cataract House on Tuesday evening of last week. Hon. Arthur Hastings, Mayor of Niagara Falls, delivered the address of welcome, after which Dr. Coleman Sellers described the work of the Cataract Construction Company. This is the first time that any of the officials of the company have spoken publicly in detail of the difficulties which were overcome, and the finally accepted plans as worked out and with which Dr. Sellers, Mr. Brackenridge and others have been so intimately associated. It may be said, therefore, that this is the first official report, and the members of the Society were fortunate in having the opportunity of listening to the detailed description, and later of visiting the power house.

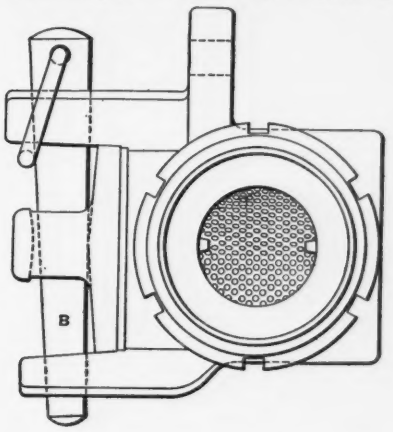
Wednesday.

After the business session Wednesday morning the papers by Messrs. George H. Barrus and Bryan Donkin, which were given in abstract in our last issue, were read; but no committee was appointed, as suggested by Mr. Barrus, for drawing up a code to govern engine testing.

The paper entitled, "The Hanging and Setting of Fire Tube Boilers," by Mr. O. C. Woolson, called forth a lively discussion. Mr. Woolson's attack on the present methods of hanging fire tube boilers was both commended and disapproved by those who took part in the discussion. It would be impossible to give in a word the consensus of opinion, and in fact, it may be said that the impression one received was that the members were divided on many points at issue. We have selected sufficient extracts from Mr. Woolson's paper to enable the reader to follow the line of argument presented, and to become somewhat familiar with his method of setting a boiler.

Hanging and Setting of Horizontal Fire-Tube Boilers.

While the four-point link suspension is far better than the rigid side-bracket bearing arrangement, it is open to one of the objections which the rigid bracket has, by becoming a three-point suspension, and yet not be discovered except by accident in some way, through the settling or bulging of the wall under the bracket. By reason of its different construction, the four-point link suspension does not change into a three-point suspension in the same secret way which is probable with side brackets, but it sometimes gets there, resulting in suspending the weight of the shell with its load of water and pipe connections, and sometimes more or less mason work on the top of the shell, upon three unequally distributed points. I have found this the case in a boiler hanging where the suspenders were made with an eye at the lower end, and a thread and nut at the upper end passing up between heavy crossbeams and taking a strap. The crossbeams rested on the outside walls simply, not having steel uprights to take the load off the walls. One wall having in time yielded a little, carried the crossbeams down with them, leaving the suspender slack, which necessarily threw the load on the other suspenders, and they not being distributed to carry the load in this irregular way, brought a distortion on the shell, which it is not a legitimate function for the shell and rivets of any boiler to stand.



Now let us turn to the virtues, if there be any, of the solid side-bracket suspension, leaving out the question of advantages or disadvantages of furnishing these brackets all in one casting or making them with a dove-tail construction. Many years ago the common practice was to let these side brackets rest directly upon the mason work. Later some one concluded that there should be an iron sole plate of some kind placed between the bracket and mason work, still preserving the same old castiron bracket with its more or less uneven bearing surface. Then the idea struck some one else that somehow the boiler was not quite so free to move fore and aft as it should be, and he introduced a series of rollers between the aforesaid plate and the uneven palm of the bracket. Some constructors use one roller, others use several, under each bracket, but on what theory the use of more than a single roller was based I cannot say, unless it was that if one roller was a benefit, several rollers must be more so, until at the present time the commonest practice is to use several rollers under each bracket except under the two for-

ward ones. The forward brackets are supposed to be anchored in the walls which fix the boiler at this end.

Now let us analyze first the construction, and next the erection, of this system in a boiler setting: In the first place, to have side brackets to perform creditably their function, the bearing face which is to rest on the rollers must have a perfectly true and smooth face. The faces of the brackets should be level or in line with the shell, both longitudinally and transversely.

Now let me call attention to other features of the roller practice: The roller which is found to get a bearing at one end only when positioned practically square with the boiler will not remain in that position, and the most natural thing for a mason to do is to see if by cutting it round a little it will not get pinched, and he finds that by cutting it round it accomplishes his thoughtless purpose and forthwith cuts all the rollers round that are loose till they pinch, and so leaves them and bricks the bracket in. Up to the present time the weight of the boiler is upon the blocking, but when that is removed these rollers which now stand in several different directions get the load and are supposed to provide an anti-friction bearing. Let us see how far this is the case. Out of three rollers under each rear bracket there is but one, we will say, carrying its load, and which stands exactly square with the boiler and is pinched its entire length (and that one I will wager stands on askew also). Of the other two, one is carrying no load at all, and the third is cut round sufficiently to cause one of two things when the shell of the boiler begins to expand and exert itself to move backward on those anti-friction rollers, to-wit: If the roller which is square with the boiler is carrying a little more load than the other one which is cut, the boiler will tend to move back in line, and the cut roller, not having the grip, will simply be slid over. On the other hand, if the cut roller has the greatest grip it will tend to crowd the boiler in whichever way the roller is cut, and the result is that something has got to yield, which unfortunately is the side walls.

I ask you now to turn to a method of hanging and setting a horizontal fire-tube boiler which I believe to be superior in every particular.

First. Hang the boiler at three points only. The rear point is to sustain two-thirds of the total weight of the boiler and becomes the swinging point.

Second. This rear point is to sustain its load entirely clear of the brickwork, upon cross channels which rest, at their extremities, on steel uprights. In the center of this crossbeam there is located a cast iron saddle in which the swinging-pin rests, and from this pin a steel strap is suspended, which spans at its lower end a heavy steel equalizing bar to which it is connected by steel pins also. At the extremities of this bar there are pinned steel links, to which the weight of the rear portion of the boiler is hung.

Third. The two forward supports each carry one-sixth of the total weight of the boiler, and consist of steel ears reaching out from the shell and resting upon long cast iron shoes set out flush with the outside walls, thus bringing this weight of the boiler upon the red brick walls and entirely off the firebrick lining of the furnace. These ears are masoned solid into the brickwork, thus fixing the boiler against any fore and aft movement at this point. The shoes are made the depth of a brick and three bricks in length, providing thereby a very liberal distribution of its load. In setting these shoes it is simply necessary to bring one side flush with the outside wall and wedge and point it up sung undr the steel ear, the ordinary mason work being sufficiently level for these plates. All the rest will take care of itself. Where two or more boilers set in one battery the aforesaid ears lap by one another on the same sole plate and are bolted together to afford a maximum resistance for the furnace buck-stay anchorage. These ears are riveted or bolted in between heavy steel angle irons, which are riveted to the shell, when the boiler is erected, but are shipped separate from the shell.

Fourth. The set of buck stays are anchored at the bottom in the usual manner, but at the top their anchor bolts hook on to the ears of the shell, thus avoiding a long rod over the top of the shell (long rods not yielding to the "breathing" of the boiler when heated up and cooled down), and always preserving a tight hold of the brickwork, keeping it snug up to the boiler under all conditions of expansion and contraction of the shell, for brickwork is quite capable of accommodating itself if you will only give it a chance.

Fifth. After providing perfect means for the movement of the shell, fore and aft, it would avail us nothing if we are to brick the shell in solid in the usual way (but we are not), for every rivet head and lap serves to anchor the shell in the brickwork, as mentioned before, resulting in cracking and general dilapidation of the walls. To overcome this I rivet a heavy 3-in. Z bar to the shell on each side.

Sixth. With the above arrangement alone we will not yet be free of all brickwork, for the rear cross wall must be considered. Therefore we provide a heavy V-shaped cast iron beam placed across the back chamber, securely masoned in at each end. This beam is placed away from the boiler head about 1¼ in.

Mr. C. W. Baker then presented his paper on "What is the Heating Surface of the Steam Boiler?" The position taken by Mr. Baker regarding the belief of the error in the present method of calculating the heating surface was discussed pro and con. While the facts stated in the paper could not be disputed, the many other questions which are a part of the problem involved seemed to make it impossible to either concur in or disapprove of Mr. Baker's suggestions. Below are given some extracts from Mr. Baker's paper:

The Heating Surface of a Steam Boiler.

Both the capacity and the economy of a steam boiler depend directly upon its area of heating surface, and should, therefore, be determined with a fair degree of accuracy. As a matter of fact, a very large proportion of the boilers bought and sold are actually bought and sold by their heating surface. The prices asked for and quoted may be the price per horse-power, but the horse-power is determined directly from the heating surface, the number of square feet allowed to a horse-power varying from 5 to 14, according to the type of the boiler. Again, in comparing the work done by different boilers, the relative heating surface is always taken into consideration.

We have now to notice the remarkable fact that in computing boiler heating surface an error of from 7 to 17 per cent. is made by a large proportion of steam engineers and boiler manufacturers. The error to which we refer consists in taking the surface in contact with the water, instead of that exposed to the fire or hot gases, as the heating surface. If the heating surface is flat of course the areas are the same, but boiler heating surface is in most cases made up of tubes, and the difference between the interior and exterior surface of a boiler tube is as much as 17 per cent. of the interior surface in the case of a 1-in. tube and is about 7 per cent. in a 4-in. tube. The error arises in the first place from a failure to appreciate the fact that the heating surface exposed to the fire is the actual heating surface of the boiler, on which its capacity depends.

The author then gives a discussion of the elementary principles on which the last assertion is based and concludes thus:

It appears to the writer that none of the arguments which have been cited in favor of computing the exterior surface of tubes as their heating surface are sound enough to justify engineers in perpetuating this error. If, however, for the sake of uniformity or ease of calculation, it should be thought best to use the exterior surface of tubes in computing heating surface, the fact that this is not the real heating surface ought to be kept clearly in mind. Misconception and wrong ideas on this point have been responsible for not a few mistakes and absurdities in the design of steam boilers.

In the afternoon the members visited the manufacturing interests in and about Niagara Falls. A large number went to the power plant of the Cataract Construction Co., the details of which were explained by Dr. Sellers and Mr. W. A. Brackenridge. In the evening a reception was held in the parlors of the International Hotel, at which time the members and their friends enjoyed the social reunion, which is such a pleasant feature of the mechanical engineers' conventions.

Thursday.

At 10.30 a. m. the members convened to listen to the reading of professional papers. In our issue of last week we gave some of the topics discussed by Mr. James W. See in his paper on "Patents," which was read by the Secretary. A discussion of this subject took up much of the time at the Thursday morning session and the importance of the subject, as evinced by the interest shown by the members, warrants a rather complete report of the discussion.

Reference was made to the different steps in securing a patent and the importance of each. In deciding the validity of a patent the court necessarily abides by the claims in the description, and for this reason care should be taken in presenting them. Thus the term 'by means of," which is so often used, is capable of being given a broad interpretation, which may prove of advantage or disadvantage to the inventor, according as the effort is made to prove his claim to cover too large or too small a part of the invention itself. Briefly, the inventor should insist on liberal specifications and definite claims.

In speaking of caveats the point was raised that generally they amount to very little before a court, because the application and not the caveat is recognized by them; but better than either is the patent, for it takes more proof to overthrow it than it does an application. The conclusion that may be drawn from this is that if an inventor has worked out in his own mind his invention it is much better to apply immediately for a patent.

Regarding the rights of joint inventors, it was stated that a man who owns a tenth of the entire capital has as much right to license the sale of the machine as the man who owns nine-tenths. In other words, the law gives a man the right to get as much out of it as he can.

English patents were said to be especially good, but some were in question whether a patent issued in some foreign language was profitable to the inventor. In Canada it often reacts on the inventor, for after a year he cannot send his made material into the country. On the other hand, in Canada no taxes are demanded for the first six years.

Considerable emphasis was laid on the importance of making drawings as soon as the idea has taken definite shape, and to have this rough drawing witnessed, the instance being cited of where Mr. Brush has had over 100 interference cases brought against him, and won all but one. It has been his practice to always make a rough sketch, no matter how small and apparently insignificant the invention. The point was also discussed as to the real date of the invention, as recognized by law, and in reply to an inquiry it was stated that the courts usually held that the date at the time of actually making a machine decides the question of a date of the invention, although another man may have actually conceived the idea a long time before, but had never put the invention into practice.

Mr. C. W. Baker thought that the paper gave too much of the patent lawyer's side and not enough for the mechanical engineer. More stress might have been laid on simple facts, such as preliminary examination. He further suggested that every inventor should obtain from Washington the official classification, giving the general divisions into which patents have been divided at the patent office, and when the inventor had decided in which class his invention belonged he should send for the patents in that series. This position, however, was objected to on the ground that the invention might be included in a number of series and the inventor, unless he could divide his invention into the elements of which it is made up, could not determine which to secure. Those interested in the subject will find Mr. See's paper a concise, clearly written and generally accurate summary of patent law.

"Relations Between the Purchaser, the Engineer and the Manufacturer," by W. H. Bryan, was then read. The grievances of the manufacturers and the true position of the engineer he summarized as follows:

First. That the engineer appears unwilling to receive suggestions or advice from the manufacturers, as such action might detract from the "dignity" of his position, and that specifications, therefore, often contain many annoying and expensive provisions, sometimes impossible of fulfillment.

Second. That the engineer does not always familiarize himself with the facilities and standards of the manufacturer, and thus sometimes calls for special designs which can only be made, if at all, at greatly increased expense; whereas standard apparatus would frequently answer the purpose equally well.

Third. That if the manufacturer is required to guarantee results he should not be hampered as to details of design or construction. In other words, the consulting engineer should not tell the manufacturer how he should build his machine, but simply hold him responsible for results.

To these it may be answered that no harm can be done by full and free consultations between the manufacturer and the engineer. They have a common object in view, namely, the securing of the best results. It is natural that the engineer should reserve unto himself a due degree of dignity, but he should not let this characteristic stand in the way of the best service in the interest of his clients.

The engineer stands between the purchaser and the contractor, and while he may sometimes insist upon his client's rights to an extent which may appear unjust, he nevertheless recognizes the purchaser's obligations as well, and will see that his end of the contract is equally well maintained. In this way unreasonable requirements may be avoided, prompt payments secured and the acceptance and settlement made at the proper time and along reasonable lines.

In the discussion the point was brought out that the architect to-day is regarded as much more important than the engineer, and it very often happens that the latter is forced to submit to practices in the construction of buildings which are known to be entirely wrong.

It was recommended that the Society draw up specifications that will bind the mechanical engineer as well as the manufacturer. No action, however, was taken on this suggestion. In the author's review of the discussion, the danger of trying to draw too closely the line dividing the rights of the engineer and the manufacturer, was pointed out. These often overlap, and any set rules which might be formulated could not be satisfactory to both.

The paper on "One Hundred Years of Ginning and Baling Cotton," by Mr. George A. Lowry, was then presented. The paper reviews briefly the history of the invention of the cotton gin and shows the necessity of baling the cotton in as small bundles as possible. Regarding the export of cotton the author states:

The world's export of cotton goods amounted to about $400,000,000 in the year 1896. Of this 95 per cent. is manufactured in Europe and only 5 per cent. in the United States, and only one-tenth of the latter amount is manufactured in the South, where the cotton is grown. This has necessitated shipping the greater part of the crop many thousands of miles and a tremendous outlay for freight and bagging. To mitigate this many millions have been expended in order to reduce the cotton to a density which will give ships and cars their full capacity of tonnage, which is about 40 lbs. to each cubic foot of space (if the package is round it would require 47 lbs. to the cubic foot).

There is about $70,000,000 now invested in the large compresses at central points and about $20,000,000 in planters' presses.

A working model of Mr. Lowry's machine for baling cotton was exhibited, as was also a bale weighing about 200 lbs., showing the compact layers formed by the machine in baling.

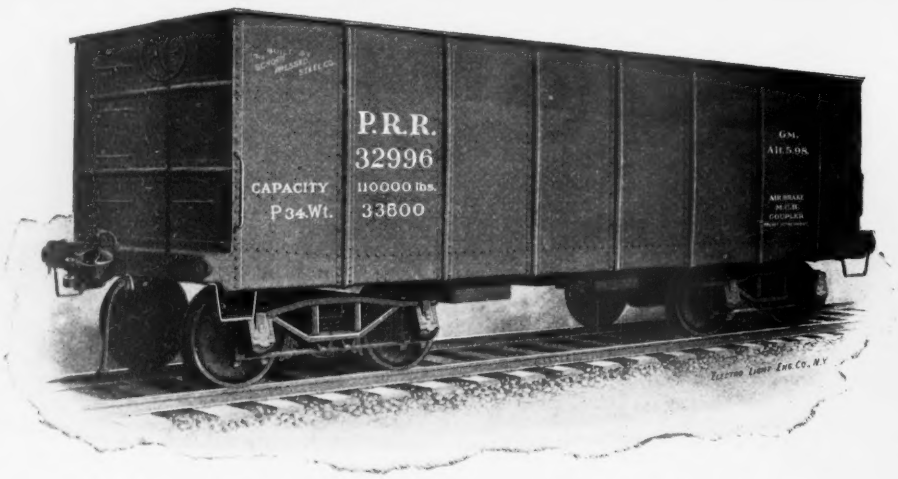
Dr. Thurston's paper was then read, but evoked no discussion.

"The Protection of Steam Heated Surfaces," by C. L. Norton, concluded the papers of the morning. The results of the tests made by Mr. Norton are contained in the accompanying table. In his paper Mr.

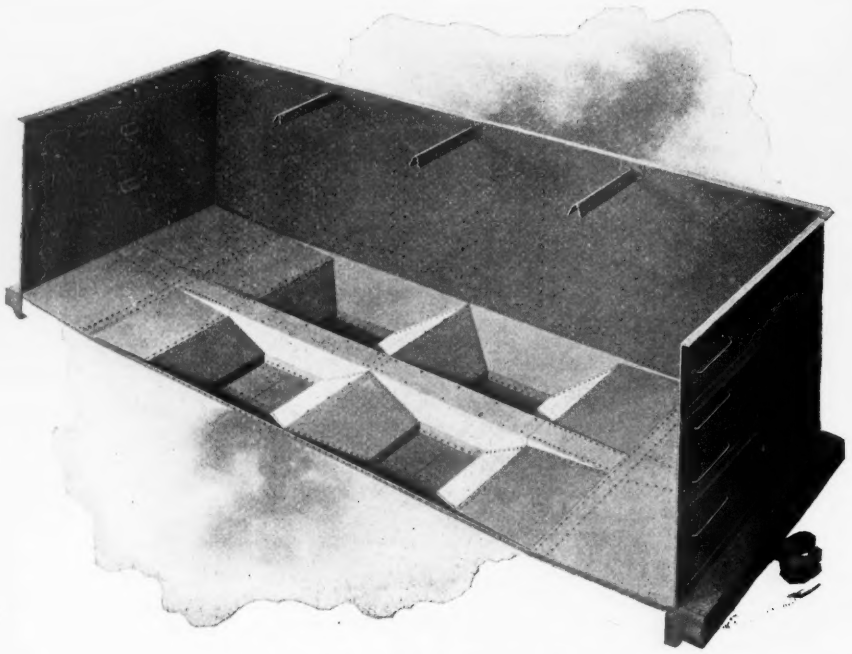
Results of Tests of Pipe Coverings.

Kind of Cover.	B. T. U. Loss per Sq. Ft. Pipe Surface per Min.	Ratio of Loss to Loss from Bare Pipe.	Thickness in Inches.	Saving over bare pipes per year per 100 sq. ft.
Nonpareil Cork Standard	2.20	15.9	1.00	$37.80
" " Octagonal	2.38	17.2	.80	37.20
Manville High Pressure	2.33	17.2	1.25	37.20
Magnesia	2.45	17.7	1.12	36.90
Imperial Asbestos	2.49	18.0	1.12	36.80
W. B.	2.62	18.9	1.12	36.40
Asbestos Air Cell	2.77	20.0	1.12	36.00
Manville Infusorial Earth	2.80	20.2	1.50	35.85
Manville Low Pressure	2.87	20.7	1.25	35.65
" Magnesia Asbestos	2.88	20.8	1.50	35.60
Magnabestos	2.91	21.0	1.12	35.50
Molded Sectional	3.00	21.7	1.12	35.20
Asbestos Fire Board	3.33	24.1	1.12	34.20
Calcite	3.61	26.1	1.12	33.24
Bare Pipe	13.84	100	....	....

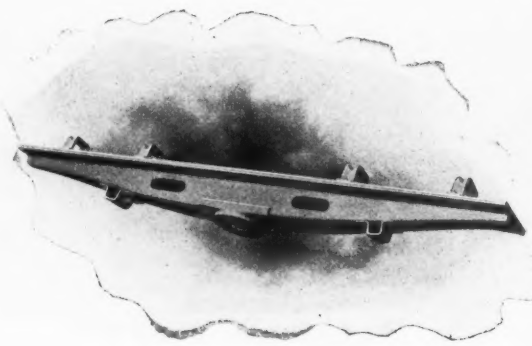
Norton states that the first object sought for in the investigation was the relative efficiency of several kinds of steam pipe covering now upon the market. The second object was to ascertain the fire risk attendant upon the use of certain methods and materials used for insulation of steam pipes. Third, an attempt was made to show the gain in economy attendant upon the increase of thickness of coverings, and to show also the exact financial return which

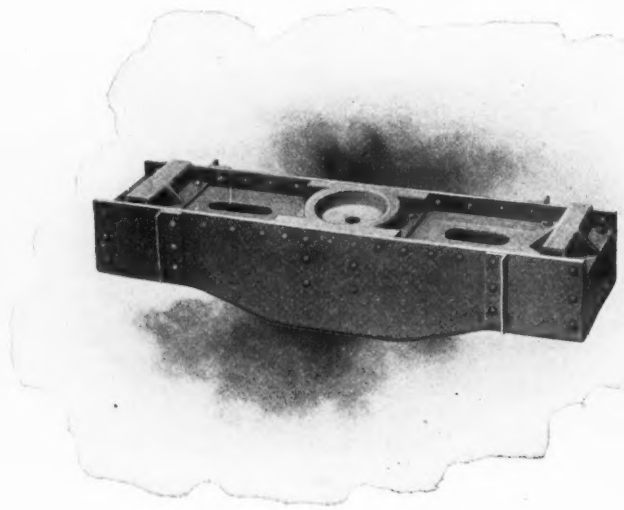


Pressed Steel Twin-Hopper Coal Car—Load Capacity 110,000 Pounds.

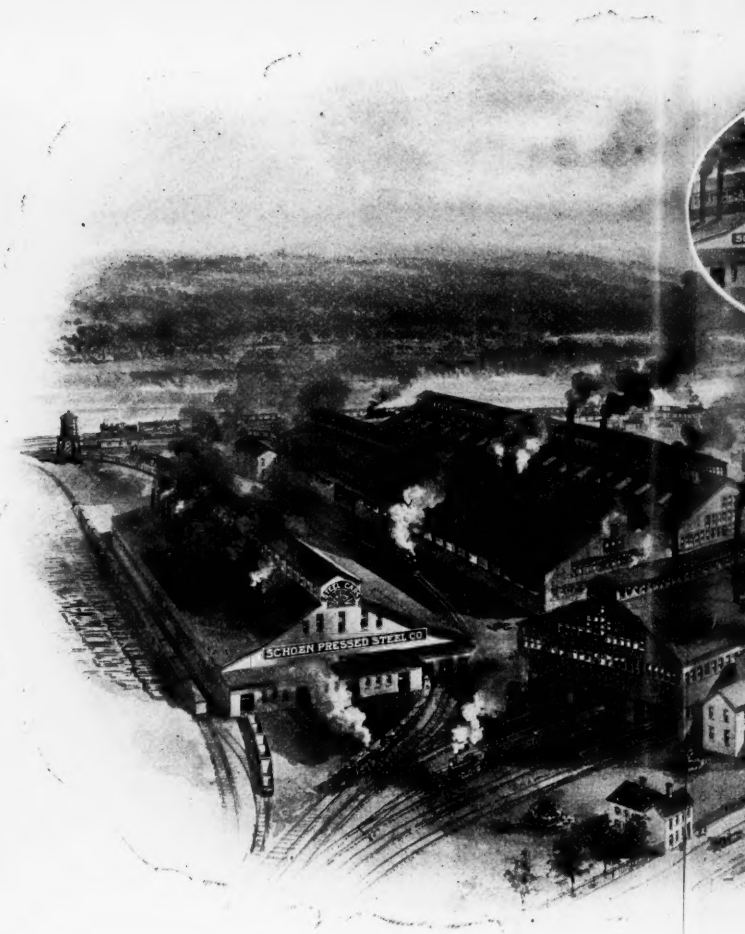


Pressed Steel Twin-Hopper Coal Car.

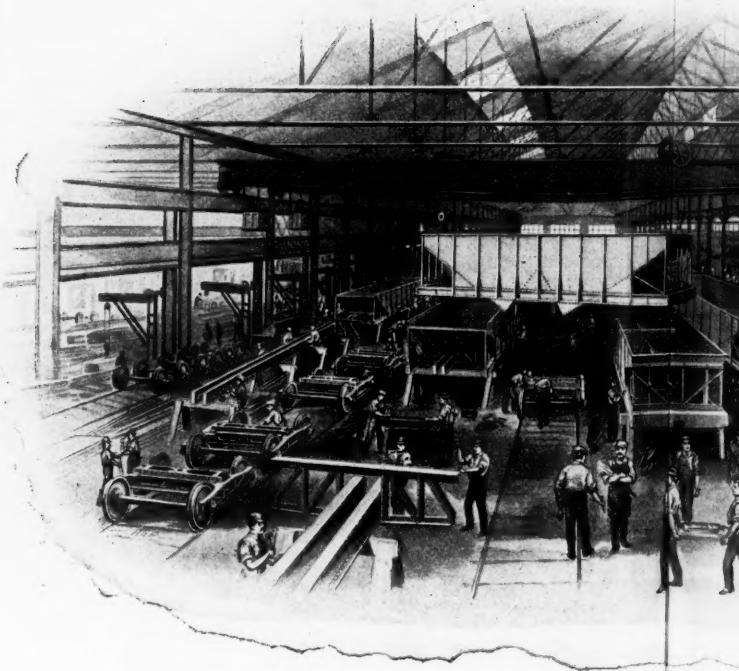




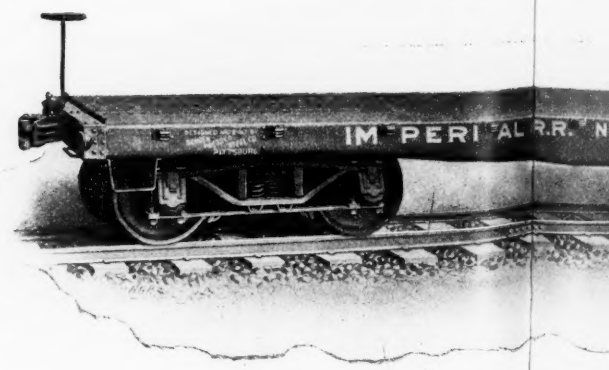
Pressed Steel Bolsters.



Schoen Pressed Steel Company's Work

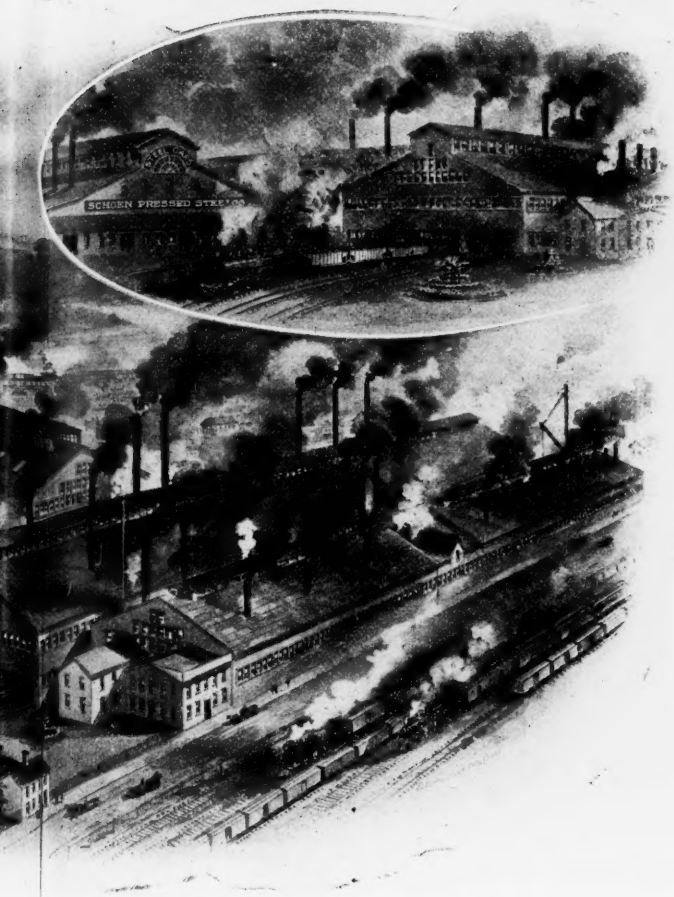


Interior of Car Erecting Depart

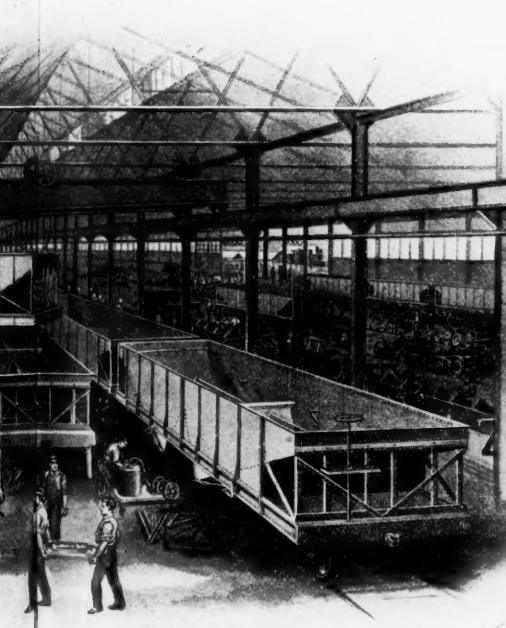


Pressed Steel Flat Car of Any Required

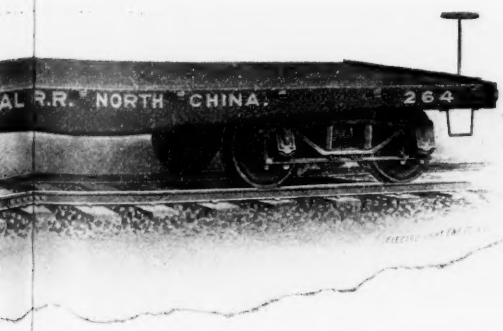
THE WORKS AND SOME OF THE PRODUCT OF THE SCHOEN PRESSED STE



mpany's Works, Pittsburgh, Pa.

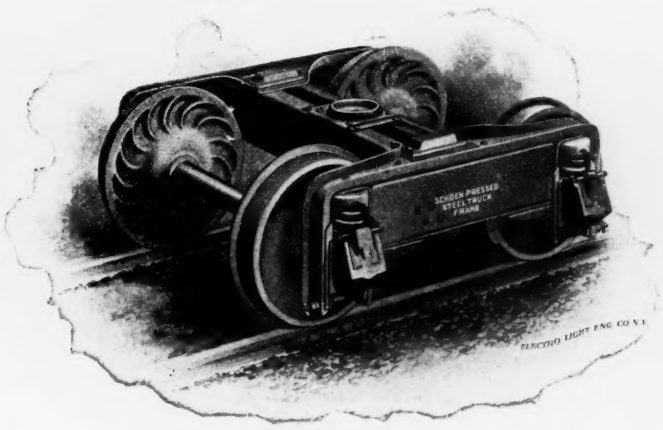


Erecting Department.

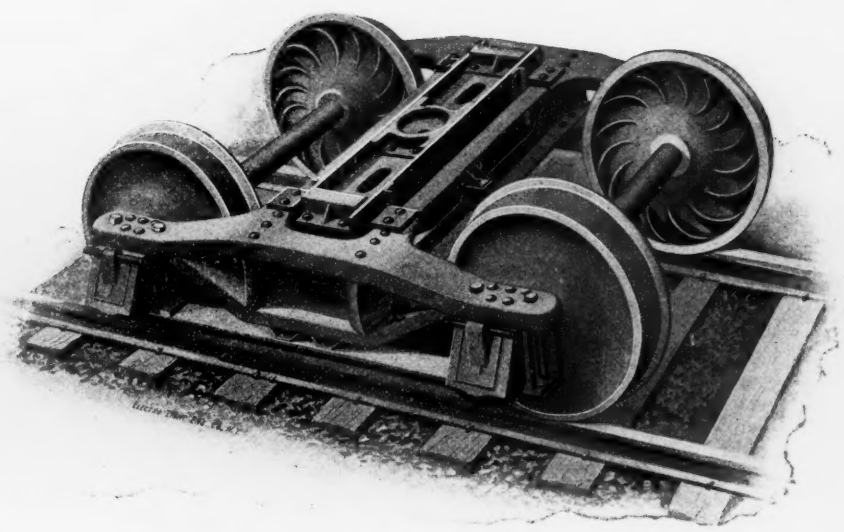


Any Required Load Capacity.

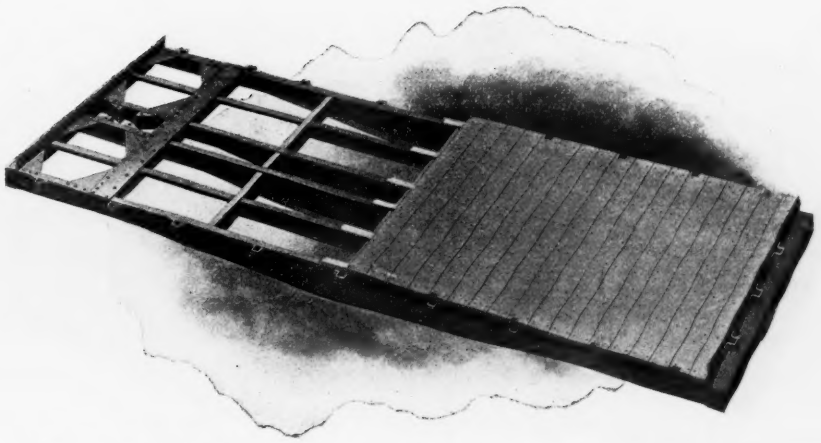
Proposed Pressed Steel Coke Car.



Pressed Steel Pedestal Truck.



Pressed Steel Diamond Truck.



Pressed Steel Underframing, any Required Capacity, for Wooden or Steel Flooring.

PRESSED STEEL COMPANY, AT ALLEGHENY CITY, PITTSBURGH, PA.

may be expected from a given outlay for covering steam pipes.

The method adopted is one which, so far as I know, is original. A piece of steam pipe is heated from the inside electrically. The amount of electrical energy supplied is measured, and hence the amount of heat furnished is known. If the steam pipe is kept at a constant temperature by a given amount of heat it is because that amount is just equal to the heat it is losing, for if the supply were not equal to the loss the temperature would rise or fall. In other words, the heat put into the pipe is just equal to the heat lost from it by radiation, convection and conduction. By measuring the electrical energy supplied I can determine the heat put in, and hence the heat given out or lost. It must be borne in mind that a given amount of electrical energy always produces the same definite amount of heat, the amount of heat furnished by one electrical unit of energy being known with greater accuracy than the amount of heat given out by a pound of steam in condensing.

In the written discussion of the above paper the statement was made that a number of coverings will show good results when new, but after a time they lose their value as a non-conductor of heat, and if the author would test further he would find the figures given would necessarily be changed if the test was made after the material was a year or two old.

The value of the results was questioned inasmuch as the tests were made when there was a flow of heat from oil to air, which is by no means the same as the loss of heat from steam to air, and the tests should be made under the conditions as near as possible as are met with in practice. In answer to this it was pointed out that while the results might be inconsistent, yet the relative value was not affected.

Mr. J. E. Sweet told of the conditions which were met when a metal sheet was placed over a pipe covering and was found to be nearly as warm as the pipe itself. In explaining the cause of this it was stated that those who had tested non-conducting material for pipe covering that if there was any leak in the covering the material was almost worthless as a non-conductor of heat; also with magnesium lagging results are unsatisfactory if the material is wet. In view of the results of the experiments of others it is probable that the loss of heat to the metal sheet, to which reference was made, was probably due to some conditions not met under ordinary circumstances. In locomotives the same conditions as cited by Mr. Sweet prevailed, but the temperature of the outside sheeting was not very hot considering the temperature on the inner side of the covering. The smoothness of the surfaces of the metals is an important element in the radiation of heat and may often be the cause of peculiar conditions such as referred to by Prof. Sweet.

On Thursday afternoon the members crossed the new steel arch bridge and took the electric cars of the Niagara Falls Park & River Railroad to Chippewa, thence down the river to Queenstown, where the river was crossed and the cars of the "Gorge" road took the party back to Niagara Falls, after making the short run to Lake Ontario. This electric road, which has received so much attention in print, has been opened for two years and is as popular as ever. The bold engineering work required in its building seemed to be thoroughly appreciated by the members, as was also the daring of the Indians, who, for the pleasure of the engineers (and some stray coins), shot the rapids in a canoe some distance below the whirlpool.

Friday.

After the meeting was opened Friday morning the Secretary announced the death of Dr. Charles E. Emery of Brooklyn, on Wednesday of last week. Dr. Emery's active work in the American Society of Mechanical Engineers since its organization in 1880, his regular attendance at the meetings and the faithful performance of his work on several committees of which he was always a most helpful member combined to make the loss felt keenly by the members of the Society, who also highly esteemed him for his sterling qualities as a man. In another part of this paper will be found some particulars of his career.

Mr. Francis J. Cole's paper was then taken up, extracts from which are given below:

Bending Tests of Locomotive Stay-Bolts.

No parts of a locomotive require so careful and systematic inspection to maintain them in a safe working condition as the stay-bolts. Speaking generally, their life, that is, the interval which elapses from the time the boiler was new or the stay renewed to their fracture, varies from about one to five years or longer. Probably the average would not exceed five years on all classes of engines. This depends, however, upon the length and height of firebox, steam pressure, size of boiler, width of grate, etc.

The stay-bolts in a boiler of large diameter, with the firebox between the frames and small curves or radii, connecting the circular portion with the vertical sheets of the firebox shell, may always be expected to have a shorter life than in a boiler of the same length of grate, but of smaller diameter, with the firebox on top of the frames.

As modern requirements demand large boilers, high steam pressure, long fireboxes, etc., in short, the very conditions which ought not to exist if the stay-bolt alone were considered, their life may reasonably be expected to be shorter than in the past owing to the construction necessary for heavier, more powerful and economical engines.

The stress on a stay-bolt produced directly by the steam pressure, tending to force the two sheets apart, is a comparatively small factor in causing its fracture, the tensile stress alone being only one-eighth to one-tenth of the ultimate strength, which, if not complicated by the expansion and contraction of the firebox, causing bending in addition, would in itself never produce a fracture. It follows, then, that the property of a metal to resist repeated bendings is more valuable than its strength to resist extension or fracture in the direction of its length.

Following out this general idea that stay-bolt iron should be tested for bending under uniform conditions of motion and rigidity with the usual tests for ultimate strength, elongation and elastic limit, a number of different makes of iron were tested on a machine especially designed for the purpose.

In designing the machine two features were kept prominently in view, viz., to make the machine rigid and to clamp the specimen so tightly that no motion would take place in the fixed end, and at the same time to strain it by tension in imitation of the stress produced by the steam pressure.

The tests were all made with a uniform length of 6 in., measured from the center of the bolt to the face of the hardened steel die, on account of the difficulty experienced in obtaining any reliable spring pressure with the bolt shorter than 6 in. The liner used in the machine for all specimens was $\frac{1}{16}$ in. thick, making the free end of the stay-bolt describe a circle $\frac{1}{8}$ in. in diameter. Great care was taken to clamp the bolt so securely in the machine that the movement of the projecting end was scarcely appreciable. The spring pressure used in all cases was 2,400 lbs., corresponding to the strain exerted by the steam pressure in a boiler where the stay-bolts are spaced 4 in. center to center, with a steam pressure of 150 lbs. per square inch.

Cutting off the threads and reducing the size of the middle of the specimen does not in these tests indicate a sufficient degree of improvement in prolonging the life of the stay-bolt to warrant the extra expense. It appears that after a bolt is reduced and turned down a sufficient amount to equalize the strain, and to distribute it over a considerable portion of its free length, the stress produced by the pressure of the spring runs up to such an extent, per square inch of section, that the combination of bending and extension stresses exercises a marked influence in shortening the life of the bolt.

In round figures, the minimum cost for labor for renewing stay-bolts in small numbers would be 15 cents per pound. This is for the simplest cases; if there is any machinery or part to be removed the cost would be greatly increased. Inasmuch as the cost of labor alone for renewals is nearly three times the cost of the highest priced stay-bolt iron it would be economical to use a special stay-bolt iron possessing the necessary properties to resist repeated bendings.

The results of the tests are given in the accompanying diagrams.

In the discussion mention was made that according to reports three times as many stay-bolts broke on the different railroads in the United States in 1897 as in 1894. Whether these broke because of the greater pressure or because of some cause not yet sufficiently accounted for is hard to tell.

One of the members stated that he had tried bolts under less pressure than was used in the experiments by Mr. Cole with better results. Where the tension was about 1,000 lbs. the bolts stood much more vibration than Mr. Cole recorded in his paper. The method of testing the bolts, as reported in the paper, was objected to on the ground that the conditions under which the tests were made were different than occurred in a boiler. Mr. Henning showed the four positions which the boiler assumed in changing from a low to a high temperature, referring to the different stresses on the bolt when the locomotive "breathed" and gave the results of experiments showing that the bolts generally crystallized because of the hammering for some distance from the head.

"Notes on the Carbon Contents of Piston Rods," by Mr. J. E. Johnson, an abstract of which was printed last week, also caused some interesting discussion. Mr. Gus Henning believed from the figures given the carbon contents was but one of a number of causes that might be given for failure of the low-carbon piston rods.

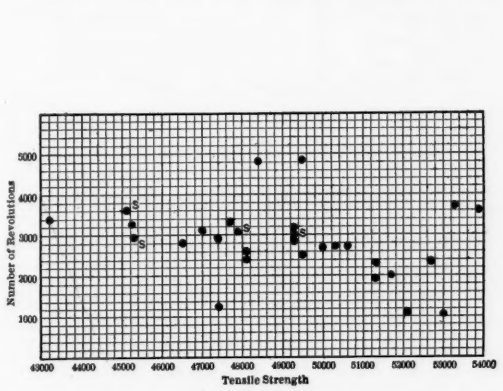
The breaking of the L. P. rods might also have been due to an insufficient length where the diameter was reduced; in other words, it sometimes happens, as was expressed, that "the rod is made stronger by making it weaker." The effect of this reduction, of course, is to give a greater length of the rod, which is free to give or to bend slightly under heavy strains, thus relieving any concentration of loads at any one point. It was pointed out, however, that piston rods on locomotives could not be reduced too much on account of buckling due to compression.

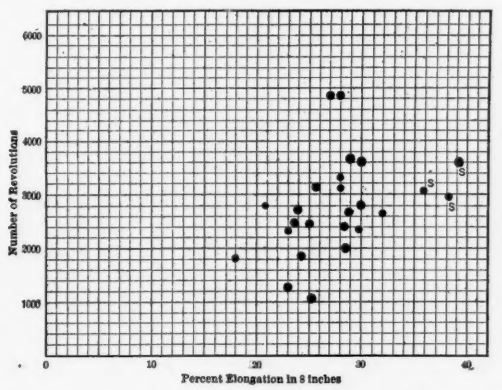
Prof. C. H. Benjamin then read in abstract his paper on "Experiments on Cast Iron Cylinders," portions of which were published last week. Prof. Benjamin added that more experiments were to be made along very much the same line when the results would be given to the Society.

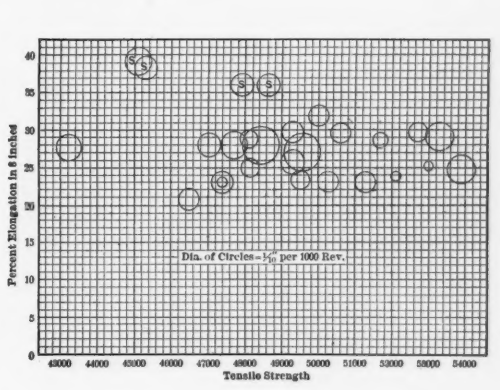
The paper on "Mechanical Properties of Certain Aluminum Alloys," by Prof. R. C. Carpenter, gave the results of a series of tests which have been made at Cornell University by the graduate students. The compound of aluminum and zinc, which has been named "alzine," by Prof. Durand, of Sibley College, possesses some very excellent qualities. The tensile strength of the material is from 24,000 to 26,000 lbs. per sq. inch. It is very rigid, and possesses very little ductility. In Prof. Carpenter's opinion, it will serve as a substitute for cast brass in nearly every instance where cast brass is serviceable, but cannot take the place of soft or leaded brasses, since it possesses little ductility.

The results of the tests on alloys of aluminum in cast iron indicate that the addition of aluminum had little or no effect on the iron, except possibly in some conditions to make it flow freely in the holes. It was found in the investigation, however, that aluminum would alloy readily with cast iron up to an amount of from 14 to 15 per cent. by weight, and produce alloys of considerable strength, but for mixtures with greater percentage of aluminum the alloys were granular, possessing practically no coherence.

The general results indicated a falling off in tensile and transverse strength, and also in power to resist impact in proportion as the percentage of aluminum was increased; or, in other words, the effect of the aluminum was to weaken the cast iron, and also to make it brittle.





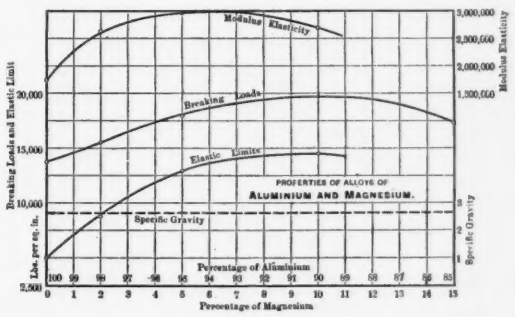


Results of Bend ng Tests of Locomotive Stay Bolts—F. J. Cole.

The accompanying curves give the properties of alloys of aluminum and magnesium, which possesses some peculiar characteristics and differ principally from the results obtained from the alloys of aluminum and cast iron in the elastic limit curve.

In the discussion the question was raised regarding the porous condition of the metal in the sample of "alzine" which was passed around, and in reply Prof. Carpenter stated it had been their experience that it produced a sounder casting than brass. The addition of tin to an alloy of aluminum and copper simply adds ductility.

The last paper was on "Method of Manufacture and



Tests of a New Seamless Tube," by Prof. R. C. Carpenter, and Mr. P. J. Fickinger gave the results of the tests with an explanation of the manufacture of a new seamless tube, which, it is believed, possesses many features which will commend its use for many purposes and to high pressures. The samples of the tubes tested were shown, and it should be remarked that the tests were made with water pressure, which, it will be understood, do not produce the same results as air when the test pieces burst. This fact, however, does not in any way lessen the value of the results obtained. Below is given an abstract of the paper:

A New Seamless Tube.

During the past few years the manufacture of seamless tubing has grown to be an important industry, due principally to the demand which has arisen in the process of manufacturing bicycles.

The seamless tubing to be described in the follow-

(*Continued on page* 414.)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY.
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The conclusions of Mr. Demoulin as to the value of the locomotive (on another page) are comfortable reading after all the bad things the electrical people have said. They have the greater weight as they coincide exactly with the best opinion of motive power men in this country that the modern steam locomotive is a simple, economical machine well adapted to its work. Some people undoubtedly believe that it is only a matter of a short time before steam locomotives will be generally discarded for electric motors, in much the same way that electricity has replaced horse and cable traction on street railroad lines. Others, who have given much time and thought to the development of the steam locomotive, are seriously considering whether continued efforts along the old lines is advisable. But the sweeping prophecies of the promoters of electric traction for steam roads have up to this time failed to come true, and we have seen no discussion of the question of hauling a heavy traffic long distances at high speeds which would go to show that under such conditions trains can be handled by electricity nearly as satsifactorily or economically as with modern steam locomotives. This has all along been the contention of those who have made an unbiased study of the question. There is no reason for diminishing the effort to study and perfect the steam locomotive, and in fact, the work of the associations and clubs devoted to such investigation is growing in importance each year. Mr. Demoulin's caution against resorting to exceptional or complicated arrangements for obtaining increased economy does not apply so strictly to locomotive practice in this country or England as to that of the Continental countries of Europe, yet simplicity, compactness, endurance and lightness of parts are essential qualities which cannot be too strongly recommended.

Roller Side Bearings.

There has been for several years past a good deal of discussion of the general design of metal cars of large capacity, and it would seem that the details are now to come in for more attention. One of the problems which has been brought up is how the load of the car body and lading can best be carried down to the truck bolster.

It is evident in general that all the load may either be concentrated on the center plate, making one point of support, or distributed between the center and side bearings, thus supporting the load at three points. Former practice with 40,000 and 60,000-lb. cars offers little in the way of precedent, as until recently wooden bolsters have been used almost exclusively, and these invariably allow the side bearings to come in contact, with no provision for reducing the friction between the bearings. About the only thing which has been learned from the use of wooden bolsters is that greater strength and stiffness are needed, and an idea has been gained of the importance of reducing the friction of the side bearings to a minimum.

With large-capacity, hopper-bottom cars there is ample room to get in a body bolster of almost any depth desired, so that with such cars it may be quite possible to carry the load at the center plates without producing sufficient deflection in the bolsters to bring the side bearings together.

If, however, we are to have a 100,000-lb. capacity box car, the problem of the distribution of the load on the truck bolster is more difficult. The height of the car body is practically fixed by the present height of platforms, and there is now scarcely room with the 60,000-lb. cars to get in a body bolster of sufficient depth even when the top member of the bolster is placed above the floor timbers. It therefore seems probable that under these conditions the design for large cars will have to provide for carrying some portion of the load at the sides, and that the roller side bearings will be necessary. Mr. Waitt, at the last meeting of the Western Railway Club, strongly advocated this arrangement, and said that there are now roller side bearings on the market which work satisfactorily. We know of no one who has given the question of side bearing friction more attention, or who is better qualified to speak on the subject, than Mr. Waitt. The advantage of applying part of the load at the sides is that lighter bolsters can be used, and there is rolling friction between the side-bearing plates both when the cars are on straight track and on curves.

Interchangeability in Locomotive Parts.

It would seem from an article in another portion of this issue that general interchangeability of locomotive parts on English railroads has been carried to a point far beyond anything attempted in this country, except in a few recent instances. We do not refer to the mere standardizing of the smaller details for one or more classes of engines, but to the design as well of the principal parts so that they shall be interchangeable for both passenger and freight locomotives. For instance, Mr. Demoulin refers to the practice of the Great Eastern, where five types of engines differ only in the diameter and arrangement of the driving wheels, connecting rods and brake rigging. The Lancashire & Yorkshire, likewise, at the end of 1895 had 1,006 engines of four types with interchangeable parts. There is no road in this country which can show such a systematic arrangement of its motive power.

Of the engines recently built, two notable examples may be cited as showing a tendency toward general uniformity in passenger and freight engine design. Some new engines for the Wabash Railroad were illustrated in our issue of April 1 last, and this lot consists of five Atlantic type passenger engines, and 15 ten-wheel single expansion and five two-cylinder compound freight engines. The only difference between the simple and compound freight engines is in the cylinders. Both classes have the same arrangement of wheels and over all dimensions and differ only in that the passenger engines have larger driving wheels, a pair of trailing wheels in place of the rear drivers, and a slightly deeper fire box and drop frame. The tenders are the same for all.

Probably the best instance of general interchangeability is shown by the Wisconsin Central ten-wheel engines illustrated June 3. Four of these are passenger and six freight and, as was noted at the time, are identical in all respects, except that the passenger engines have 69-in. driving wheels and 19-in. cylinders, while the driving wheels of the freight engines are 63 ins. in diameter and the cylinders 20 ins. The same cylinder castings, however, are used for both classes. In these engines the extreme limit seems to have been reached.

It is not necessary to state the reasons why general interchangeability or any systematic arrangement, for that matter, is desirable, if it can be got without too great cost. But it is a question to be be decided by each road individually how far the local conditions will permit this idea to be put into practice, and in any case a long period is required before any considerable part of the equipment of a large road can be brought to a state of uniformity. It may be that in many instances this at the best could only be done in part.

When it is considered what rapid changes have taken place in locomotive design in the last ten years, that steam pressures have been raised about 50 lbs. per square inch, and the size and weight of locomotives correspondingly increased, it is readily understood that railroads which have purchased many engines in this time have a great variety of designs in service. The consolidation of different roads has also in many cases greatly added to the variety of the equipment. The Pennsylvania Railroad is probably better off in this regard than the majority of large roads in this country, but we find by the last classification list issued that it has six general classes of engines. In the eight-wheel class, four drivers and a leading truck, there are thirty so-called types which vary more or less in the dimensions of the principal parts, and in the same way the ten-wheel, mogul and consolidation classes include each a number of types differing among themselves, and there is no uniformity of the principal parts extending from one class to another. This miscellaneous stock is plainly the result of a gradual development, and it becomes a very important question as to how much can properly be sacrificed to uniformity. A too rigid adherence to standards is not conducive to improvements, and many conditions have to be considered, but it would seem that the results to be gained in the end are enough to warrant considerable effort, not only to standardize the small details, but to bring the principal parts of new engines into some uniformity.

Notes of a Year in Car Building.

It may not be out of place at this time to sum up the principal events of the year in car building. The period has not been marked by any radical departures, but considerable progress has been made, especially along the lines of large capacity cars for special classes of service.

By far the most notable orders have been those of the Pittsburg, Bessemer & Lake Erie and the Pennsylvania Lines for 100,000-lb. steel cars, and so far all the important orders for metal cars have gone to one firm. This has undoubtedly been a disappointment to the bridge and structural steel works, which were expecting a share of this business. Designs have also been made for coal and ore cars, which will carry 110,000 pounds, so it would seem that the capacity limit has not been reached. Up to this time the big cars have all been intended for the coal and iron regions of Pennsylvania, but it is likely within the next year similar cars will be used on some of the roads in the extreme West; in fact, one such road, the Northern Pacific, has already prepared plans and estimates for some large composite cars of steel and wood.

There has also been much activity in wooden freight car building, and the contract shops have been pretty busy, as also have the railroad shops. The road ordering the largest number of cars was the Baltimore & Ohio, altogether between 5,000 and 6,000, while at least a dozen others have placed single orders for as many as 1,000 cars each. The larger orders naturally went to the big builders, still the small car shops as well have been busy, and some of these have lately been running for the first time in several years. Judging from the new cars built, it would appear that wooden box cars for grain and general merchandise are now being made of 60,000 pounds capacity, wooden coal cars principally 70,000 and 80,000 pounds, and metal cars for coal and ore 100,000 pounds capacity.

The safety appliance law together with the increased amount of new car building has made a good market for couplers and air brake apparatus. There are now said to be over one hundred different makes of vertical plane couplers in use, and nearly every coupler requires a slightly different knuckle, so that much useless expense is incurred by the roads in carrying repair parts. Already the question has been raised as to how greater uniformity in these parts is to be brought about, and it has been proposed to make the test specifications so rigid as to wipe out a lot of miscellaneous couplers, and continue this process until only a reasonable number remain. This is a question which eventually must be settled by the M. C. B. Association.

The use of malleable iron draft attachments seems to be meeting with approval, as it simplifies the draft rigging and permits the coupler to be readily replaced. Grey iron castings in the best wooden cars have now been almost entirely replaced by malleable iron, while cast steel and pressed steel are used to a more limited extent.

At this time last year the metal car truck was a subject of very live interest. All the different trucks so far brought out may be classified under two heads, those in which solid plate frames are used, and those which make use of arch bars. The first class has come to contain many different designs of side frames, including pressed steel plates, I-beams, channels and angles, while one truck requires the rolling of a special shape and another has cast steel frames. Where arch bars are used, the only new feature introduced is the bolster, and these are

now made either of built up sections, rolled shapes or of a single steel casting. Some predicted at the beginning of the metal truck movement that the plate and similar frames would not be rapidly adopted if they ever replaced the arch bar type to any extent; further that the use of metal bolsters with diamond frames would first come into general use. It seems likely that this may be the case. At any rate the number of new cars fitted with solid frame trucks has been but a small percentage of the total number built, and these mostly of one make, while a great many cars, both old and new, have been equipped with metal bolsters and arch bars. Naturally the price of the bolster has had much to do with its selection, and it is too soon to decide how well some of the cheaper varieties will stand hard service. In any case, however, they are a great improvement over the old wooden bolsters.

It can be safely said that with the exception of one make, that has been on the market for a number of years, the special solid frame trucks have so far only been tried in an experimental sort of way, and none of these has as yet shown any marked advantage over the diamond frame types.

One of the chief objections to arch bar trucks has been the lack of rigidity, causing an uneven wear of the brasses, with the consequent heating and friction. The results, however, of some recent tests, with a modification of the M. C. B. journal bearing key, seem to indicate that this difficulty can be entirely overcome, and if this proves to be the case, the diamond frame will likely be retained. And, on the other hand, this very lack of rigidity is claimed as one of the valuable features of the steel, diamond truck.

Steel axles have been largely used on new cars, and this material is fast replacing wrought iron wherever alternating stresses are to be met. A new journal box of the M. C. B. type, having the joints so formed as to exclude dust, has also been used on about 12,000 new cars.

The question of standard springs for freight cars has been studied and discussed by one of the railroad clubs, and it appears to be a subject deserving of considerable attention. Two new brakeshoes have already been brought out, one a soft composition shoe, and one a combination of steel and cast iron. The latter especially has been very favorably received, and has already become standard on several large roads. In this connection, it should be noted that the M. C. B. brakeshoe testing machine has been removed from Wilmerding, Pa., to Purdue University, and the building in which it is to be placed is nearly finished. This apparatus will be working by the first of September.

With passenger cars the most striking performance has been the building of limited trains by the roads running into Chicago. Each of these is intentionally made more elegant than those previously built, until the practice has been carried far beyond reason. The builders are the only parties who can possibly be benefited by these costly trains; they are not required, nor are they in keeping with the roadbed, bridges, signal appliances, stations or any other part of the equipment.

Of the tendencies toward improvement in passenger cars should first be mentioned the use of the steel platform, which, taken in connection with the vestibule, forms one of the most important advancements in passenger car building. Much interest also is now taken in electric lighting for cars, but so far such lighting has not advanced beyond the experimental stage, although some recent installations promise to give satisfactory results. No road has yet attempted to light all its cars by electricity, and those so far equipped with electrical apparatus have been only the first-class trains. Three schemes have been tried for supplying current to the lamps, first by storage batteries, which are recharged at terminals; second, by an engine and dynamo placed in the baggage car, for which steam is piped from the locomotive boiler; and third, by a small dynamo under each car which is belted to a driving pulley on the axle, a storage battery being used in connection with the generator. The Atchison, Topeka & Santa Fe has now fifty cars equipped with axle-driven generators, which is the largest installation yet made of this system.

It may also be noted that during the past twelve months several more passenger cars have been finished with sheet metal, instead of by painting. The method, it will be remembered, originated on the New York, New Haven & Hartford.

Recent tests of special chilled iron car wheels have shown that cast wheels can be made which will better withstand the blows of the drop test than steel-tired wheels, and these tests have again directed attention to the question of the use of cast-iron wheels for passenger cars.

While some important problems have been considered, there have been no fads in the car department which have received more than their just share of attention; on the whole, the time since the last convention has been a busy and profitable one, with little chance to take up new ideas or theories.

Annual Reports.

Chicago, Rock Island & Pacific.—The annual report of this company for the year ending March 31 is the first to be issued by any of the large Western companies, showing the effect of the past year of high agricultural prices and large crops and the freer movement of freight which they have induced. The report is cheerful reading for the stockholders, and the results shown justify the Directors in their action last week in increasing the dividend rate from 3 per cent. to 5 per cent. The dividend next year, however, will have to be earned on over $50,000,000 of stock, the Directors having also authorized a stock dividend of 10 per cent. But the company will save about 1 per cent. on the stock by its bond refunding, and in the first two months of the new fiscal year it has gained $682,000 gross. In the 1898 fiscal year there was a gain of $2,401,931, or 14 per cent., in gross traffic receipts, nearly all of which was saved for the company's treasury. Operating charges being $983,139. or 8.5 per cent., larger, net traffic revenue gained $1,418,792, or over 25 per cent., as compared with the 1897 figures. The gain in net revenue was, as a matter of fact, alone equal to over 3 per cent. on the outstanding stock. The available income for dividends was equal to 7.2 per cent. on the stock, and as the 3 per cent. paid called for only $1,384,674, the substantial balance of $1,937,180 was carried to the credit of income account. This important improvement in revenue was, however, practically all made in the last eight or nine months of the year.

The great gains in earnings did not begin until last July, and all but about $143,000 of the increase of $2,400,000 in gross was earned after that month. The summarized income account for the last two years follows:

	1898.	1897.	Inc.
Freight earn.....	$13,835,995	$11,229,175	$2,606,820
Pass. earn.....	4,316,817	4,072,127	244,690
Mail, etc.	1,395,771	1,845,350	*449,589
Total gross	$19,548,583	$17,146,652	$2,401.931
Oper. expen. and taxes...	12,595,966	11,612,827	983,139
Net earn.....	$6,952,617	$5,533,825	$1,418,792
Other income	479,785	12,242	467,543
Net income	$7,432,403	$5,546,068	$1,886,335
Fixed charges	4,110,549	4,102,472	8,077
Dividend (3 p. c.).....	1,384,674 (2 p.c.)	924,116	461,558
Balance	$1,937,180	$520,480	$1,416,700

*Decrease.

The gain in gross was due to the improvement in freight receipts. These, in fact, exceeded the 1897 totals in every month of the last fiscal year, while passenger revenues showed a falling off until August. The losses in miscellaneous receipts continued throughout the year. The large increase in "other income" is due to a credit of $470,785 from loans and investments.

Although the gains in gross revenue are so large, they have not brought the revenue up to the highest previous total, the 1893 and 1894 receipts having both been above the 1898 figures by $1,423,000 and $1,491,000 respectively. The net traffic earnings, however, are $891,000 above the best previous figure. The saving in expenses does not indicate economy in maintenance, but rather increase in operating efficiency. The trainload is not stated in the report, but from the statistics given it is shown to have been 118 tons in 1894, while in 1898 it had risen to 169 tons. As compared with 1897 this last figure was a gain of 11 tons. Comparing the traffic movement of 1898 with the previous year we find that the tonnage increased 19.5 per cent and the ton-mile 20.9 per cent., while the freight train mileage was only 12.7 per cent. higher and the cost of transportation was but 6.9 per cent. higher. The freight train mile earnings were $1.65, against $1.51 in 1897, and higher than in any previous year. In 1894 the freight train mile earnings were only $1.18, while the ton-mile rate was 3 mills higher. The more important of these figures for 1898 and 1897 follow:

	1898.	1897.	Inc.
Tonnage.....	7,755,715	6,492,168	1,263,547
Ton-miles	1,421,433,866	1,175,517,765	245,916,101
Freight train, miles....	8,387,650	7,437,841	949,809
Total train, miles.....	18,128,984	16,632,587	1,496,397
Average carload, tons..	15.2	14.9	.3
Av. ft. train haul, miles	200	197	3
Ton-mile rate, cents....	.97	.96	.01
Pass.-mile rate, cents..	2.10	2.18	*.08

*Decrease.

The expense accounts of the company have not heretofore been published in the form which most readily facilitates comparison between the different divisions of working charges, but an examination of the 1898 expenses and those of earlier years shows economies in such items as train service, trainmen's wages, fuel, car mileage, etc. How those savings were effected may be appreciated from the fact that while in 1894, for instance, the ton-miles were 133,000,000 less than last year, the freight train mileage was 2,500,000 more.

The following summary of the 1898 and 1897 expenses follows the form of the Interstate Commerce Commission, and is the first time that the expenses have been so collected in the annual report:

	—1898.— Amt.	Per Cent Total Operat. Expen.	—1897.— Amt.	Per Cent Total Operat. Expen.	Inc.
Maintenance of Way and structures....	$2,968,741	25.28	$2,709,691	25.22	$259,050
Maintenance of Equipment	1,710,855	14.57	1,424,713	13.26	286,141
Conducting Transportation..	6,155,513	52.43	5,756,124	53 58	399.389
General Expenses.	906,294	7.72	852,620	7.94	53,674
	$11,741,403		$10,743,148		$998,254

From this it appears that the increase in cost of transportation was only about two-fifths the total gain in working charges, while the two maintenance items absorbed $545,000 of the increase and 1.3 per cent. more of the total in 1898 than in the previous year. The proportion borne by the transportation account fell off 1.2 per cent.

The capital accounts show no material changes from 1897. During the year the company has completed arrangements for refunding its debt by which a saving equal to about 1 per cent. on the capital stock will be effected in interest payments, but this does not appear in the present report. The total cost of the Chicago track elevation to date has been $789,654. During the year 15.9 miles of side tracks were built, at a cost of $70,059. Other improvements made during the year charged to construction and equipment account aggregated $437,989, but this was reduced by a credit of $173,788 received from the sale to the Pullman Car Co. of the Rock Island's half interest in 41 sleeping and nine tourist cars.

Graduating Theses in Engineering Schools.

The nearly universal practice in engineering colleges is to require a thesis before a degree is given. The time allotted to make the investigation and the facilities given by the colleges to carry out the work vary considerably, but every year the importance of a high requirement in thesis work is being more generally recognized, which alone is sufficient to account for the uniformly good work now turned out by so many of the colleges.

In order to keep in even closer touch with the work at the different schools, we recently obtained, through the heads of the engineering departments, the lists of the subjects selected by or assigned to the members of this year's graduating classes. These lists give the subjects of about 350 students, and the number is sufficient to be representative of the similar work in all the engineering schools. In looking through the different lists one is impressed with the wide range of subjects of great interest to all engineers, and this is an indication of the efforts of the schools to keep close to engineering as practiced. Take, for example, the subject of gas engines. We find no less than seven colleges in which students are investigating some phase of the subject. In at least three instances we know that this subject is of particular interest to the instructor in charge of theses work, and this shows the influence of their interest on the nature of the investigation. In one college, with a class numbering about thirty, five have discussed the subject in some form.

What is the effect of such investigation on the student, and what is the actual value of the results obtained are two queries often raised. In the first place, if the work has been done thoroughly, it should—in this particular instance—fix in a working form the thermodynamic principles learned, and show to the young engineer the real value of his theoretical training in being able not only to analyze the results, but to locate and remedy any defects and possibly to make the machine as a whole more perfect. In studying with these aims in view, the young man acquires a store of accurate information which is sure to be either directly or indirectly of great service to him throughout his professional career.

The subject of hydraulic rams is also being investigated by at least three different students in as many schools. This might appear at first to be a subject of only secondary importance, but the mechanical principles involved, the lack of accurate information from careful experiments regarding the best ratio of height of supply to delivery pipe in the better types of rams now made, and many important points growing out of some theoretical considerations, make such a subject worthy of the student's thought and time in carrying out the investigation. The above remarks might apply in a general way to some subjects in the strictly civil engineering departments, notably special designs for bridges, which is so often discussed by those about to graduate, and, if properly done, is the foundation of many a young man's success in bridge building.

Answering the other question, it may be said the actual contributions to science by the theses work are very few and insignificant compared with the time and effort spent. But this is not strange, or should it be otherwise, for the young man is not sent to college to become famous, but rather to learn

what others have done, and, as far as time will permit, train his hands so that they will be competent to perform accurately and quickly experiments illustrating the principles learned in the four or more years of college life. Much more might be said on this point, but it seems somewhat irrevelant to the subject at hand, so we will pass to another observed fact.

In but very few technical schools is there any particular interest in subjects in strictly the railroad field. At one western institution just the opposite condition is manifest in the mechanical engineering department, and this class of investigation at that institution has done more than everything else to make it known to the world. Every college, however, can not undertake a similar work, and might not desire so to do, even if the financial means were at hand, there being other subjects regarded by some professors as of greater importance. Here we find that the student is assigned a topic, and in many cases the investigation touches but one branch of the subject, the completion of the series of tests to complete the entire work covering many years. This will be particularly true with the many tests being made on the new locomotive sent to the university last year, and illustrated in our issue of Dec. 17 last. Where such a series is carried out there is usually more general oversight of the work, and the results have greater weight than where there can be no opportunity to check up the results of previous experiments. We have more to say on this subject, but will save it for another time.

On the Atchison, Topeka & Santa Fe there is now in force a regulation requiring rear brakemen to note and record the condition of signals, and the results of the employment of this regulation for a considerable time have been so favorable that it is intended to have it applied more extensively. It is now in use only on night passenger trains. The rear brakeman or flagman carries a paper showing names of stations and ruled with five blank columns for notations, in which he records the time of arrival and departure at each station, the position of the semaphore signal after the train passes it, and whether or not switch lights and signal lights are burning. It is proposed to adopt this rule on day as well as night trains. As the Atchison has some automatic block signals (which, we believe, do not go to the danger position before the engine passes them) superintendents and signal engineers who are undecided whether or not to locate automatic signals exactly opposite the beginning of the block section, may perhaps be able to get from the experience with this rule some light on their dilemma. To have the signal go to danger in the face of the engineman enables him to check improper working of the apparatus, but it is inconsistent with other signaling; and on single track there is the possibility that trains from opposite directions might enter a block at the same instant, thus necessitating a second signal at one end. On the other hand, if the signal goes to danger after the engineman has passed it he does not know whether it has actually worked; and, although scores or hundreds of signals are thus worked, the only assurance their sponsors give that dangerous failures do not occur is the asseveration that they have unbounded confidence in the perfection of the apparatus and the efficiency of the inspection by the signal department. It is to be hoped that the Atchison rule will be submitted to an extensive trial.

The latest report of the discovery of a mare's nest comes from Canada. General Manager Hays of the Grand Trunk has notified the employees of the road that a new code of train rules will be adopted on July 1, and some of the men have discovered that in this change there is great danger that the oldest Canadian railroad is to be unduly "Americanized." The danger is so alarming that it has been made the subject of Parliamentary inquiry Various members have declaimed about the rights of employees and the danger to life and limb that employees and passengers will be subject to as soon as the ancient rules of the Grand Trunk are laid aside. So far as we can judge by the newspaper reports the most serious fault yet found is a rule requiring freight brakemen to be on the tops of the cars when trains are moving up grade! As Mr. Hays is, doubtless, simply adopting the improvements embodied in the standard code of the American Railway Association, which were put in use on his former road, the Wabash, with marked satisfaction some ten years ago, and have since been substituted for the former hodge-podge codes on thousands of miles of the best roads in the United States, we feel justified in counseling the Canadian legislators to calm themselves, and to show their sympathy with "labor" in some way. The real trouble seems to be a fear on the part of some employee that the new rules will require the importation of men from "the States" to do work now done by himself and his fellows; a fear which, we feel safe in assuring him, will prove entirely groundless.

TRADE CATALOGUES.

The Peckham Truck Co. has issued Bulletin No. 10, dated June, 1898, which contains illustrations of the cantilever extension, double and single trucks for electric cars, designed especially for fast or slow speed, and for heavy passenger and freight service, also special designs for special service. Excellent engravings show the different trucks, and the circular, printed with bold type in red and black, on substantial paper, gives it a very attractive appearance. A list is given, showing where more than 6,000 trucks are in use in this country, and over 600 in foreign countries. We note that the Brooklyn Heights Railroad has 1,300, the Union Traction Co. of Philadelphia 1,250, Metropolitan Street Railway Co. of New York 650, and the Consolidated Traction Co. of Jersey City 440. Among the foreign roads the New South Wales tramways of Sydney, N. S. W., has 108, the Dublin tramways 191, and the Middlesboro tramways 100. The extra heavy locomotive truck, No. 17, which is shown by a large engraving, weighs, with 4 motors, 40,000 lbs. This is described completely in special catalogue D, and has been referred to in previous issues. Peckham's improved motor axle, with rigid motor collars, is described in some detail. In this axle the rigid steel collars are pressed on the axle by a hydraulic pressure of 10 tons, and to provide for their wear flanges are provided, to which are bolted sectional washers, made in halves. When worn out these washers can be easily and cheaply replaced. The rigid collars prevent the necessity of cutting grooves in the axles and the use of ordinarily used loose collars, thereby giving a stronger axle and preventing noise and dangers from loose bolts.

High Pressure Valves and Fittings.—The Kennedy Valve Mfg. Co., 75 John St., New York, has issued a handsome catalogue of extra heavy gate valves and cast iron fittings for steam pressures up to 250 lbs., superheated steam. The catalogue also shows gate valves for hydraulic service, indicator devices, blow-off valves, etc.

Russell Snowplows and Flangers.—The Russell Snowplow Co., Tremont Building, Boston, Mass., sends us its 1898 catalogue of snowplows and flangers. We have so frequently described this machine and it has been so widely used that it is unnecessary now to do more than to call attention to the fact that those who are interested in it can get the catalogue by sending to the above address.

Vulcabeston.—The H. W. Johns Mfg. Co., of New York and elsewhere, issues a special June, 1898, catalogue of their Vulcabeston materials for mechanical and steam uses. This is called a railroad edition and is of the standard size, 3½ in. x 6 in. It gives lists and prices of materials, and a number of letters of recommendation.

Niagara Falls Meeting of the American Society of Mechanical Engineers.

(*Continued from page* 411.)

ing paper is made by a process of drawing from a superior quality of steel pipe,* it is seamless in the sense that no indication of the weld which existed in the original stock before drawing is visible in the drawn product, nor could its position be ascertained by any of the numerous tests which were used to rupture the finished tubing. The tubes were tested by twisting in a torsion machine, by compression, by tension, by transverse loading and by bursting, and in no case did rupture take place in such a manner as to even indicate the existence of a weld in the original stock.

The author then describes the methods extensively employed in making steel tubes, referring especially to the Mannesmann and the Stifel processes.

The seamless tube which forms the subject of the article is made by a process of drawing from welded steel pipe. The novelty of the process lies entirely in the machinery employed in drawing and in cleaning the tubes from the oxide of iron before and after the drawing process. All other processes of producing tubing require the use of high-grade steel in order to produce tubing of reliable quality and with strength sufficient to meet the requirements of use. Swedish billets are imported for most of the steel tubing, which for the last few months have, strange to say, been quoted at exactly the same price for which the finished tubing is sold for at retail. The tubes made by the new process show as results of the tests made, equal, if not superior quality, in every respect to those made from imported stock, yet they are made from American steel costing from one-half to one-third that of the Swedish billets.

The process of drawing is accomplished by reducing the end of the tube so that it will pass through the die and can be grasped by the pulling drawhead. The drawhead is made to engage with a traveling chain, and thus pulls the tube through the die and over a conical mandrel. The principal novelty of the machine employed by the Tube Company in the improved drawing process consists in the use of a pushing as well as pulling drawhead, of a peculiarly shaped die and of the method of applying power to move the drawheads.

The method of cleaning the scale from the tube is found to have an important influence on the quality of the tubing, and has been one of the most difficult problems to solve successfully. The use of the ordinary open bath with 8 to 10 per cent. acid was found to injure the tubing materially, and after extensive experiments a more satisfactory process of cleaning was discovered, in which the use of less than 2 per cent. acid is found to clean successfully a rack of tubes in a length of time not exceeding 15 minutes. These good results are due to the fact that the tubes are immersed in a vertical position with both ends open, and in such a manner as to allow a free and uninterrupted circulation of the liquid of the bath.

In the practical operation of the plant the tubes to be drawn are passed in succession, and at a rate of 24 ft. per minute, through the different dies until they have reached the required diameter and gage being annealed and cleaned after making each pass. During the operation of drawing, whenever the length of the drawn tube exceeds from 18 to 20 ft., it is immediately cut into lengths of 9 to 10 ft., and the process of drawing continued. At present the original tube before the drawing begins, which is employed for bicycle tubing, is 1¼ in. external diameter.

Transverse Tests of the Drawn Tubing.—Test No. 2, gage 18, annealed, external diameter 0.875 in., internal diameter, 0.785, was carried on supports 18 in. apart; it supported a center load at elastic limit 340 lbs., at yield point of 370 lbs., and at maximum strength of 380 lbs., the latter load corresponding to a calculated fibre stress of 72,200 lbs. per square inch.

Endurance Tests.—A number of tests were conducted by mounting the tube so it would be supported between the centers of a lathe, in such a manner as to be free to deflect and yet could be rotated at any desired rate of speed. A bushing or washer was carried by the tube at the centre, and this was fixed so as to rotate with the tube and support a load resting on rollers. Especial care has to be exercised that the rollers freely revolve and that the bushing does not turn on the tube. The center load was selected so as to produce a fibre stress equal to 60 to 90 per cent. of that at the elastic limit of the tubing. The loads taken were such as to produce stress respectively of 58,000, 50,000 and 40,000 lbs. per square inch in the outer fibre. The number of revolutions made by the tube when loaded in that manner was denoted by a continuous counter, connected so that it would not register after rupture took place. The number of reversions of loading would equal twice the number of revolutions. The following table gives the results of this test:

No. of Test.	Name of tube or maker.	Diameter, inches.			Center load, pounds.	Stress in outer fiber, pounds per square inch.	Deflection at center, inches.	Revolutions.	
		Inside.	Outside.	Length.				Per minute.	Total.
R. 1	McCool, annealed	0.691	0.749	21	128	59,600	0.24	44 to 230	39,638
R 2	" unannealed	0.687	0.751	21	128.5	54,500	0.20	230	79,826
R. 4	" "	0.789	0.873	21	240.5	58,000	0.17	300	77.098
R. 5	" "	0.750	0.686	21	113	50,000	0.175	300 to 400	211,232
R. 7	Unannealed	1.069	1.125	21.7	280	58,000	0.15	300 to 400	14,752
R. 8	"	1.069	1.125	21.7	242	50,000	0.10	300 to 400	92,230
R. 9	Annealed	1 068	1.125	21.7	242	50,000	0.10	300 to 400	20,534
R. 11	"	1.186	1.250	21.7	348	50,000	0.10	..	25 942
R. 12	Unannealed	0.780	0 875	21.7	179	40,000	.....	..	82,154
M.	Annealed	0.810	0.884	21	218.5	57,600	0 13	230	13,214
N.	"	0.803	0.875	21	212	58,000	0.19	230	25,036
P.	" in oil	0.791	0.875	21.7	168	40,000	0.12	300 to 400	46,498

Remarks:
R. 1 stood under load over night.
P. Flew out of lathe and across the room when it broke.
R. 7. The first deflection was 0.10. The tube vibrated until about 4,000 revolutions, when it became steady, and the deflection was 0.15.
R. 11. Center load of 350 lbs. makes a decided set.
R. 12. This load is about two-thirds that of elastic limit.
M. Tube made by Mannesmann process.
N. Tube made by punching original ingot and drawing.
P. Tube made by spinning and drawing process.

Bursting Test.—Several bursting tests of tubes were made by clamping the tube endwise between two metallic heads, one of which was perforated and connected by small tubing to a pressure pump. After applying pressure of about 5,000 lbs per square inch the tubes in most cases were deflected from a vertical line, and the test had to be discontinued. In order to successfully continue the bursting test, a support or brace was placed at the center of the tube, and the tube was also reduced in length from 30 to 10 in.

The tube which bursted had an external diameter 1.254 in. and an internal diameter of 1.202 in., a thickness of 0.026 in., corresponding to a gage of between 22 and 23. The tube burst about 3 in. from the top with an internal pressure of 4,700 lbs. to the sq. in., which corresponded to a tearing stress per square inch of 108,642 lbs. It did not burst in a weld. The external diameter was increased about one-sixteenth o fan inch by the internal pressure.

The results of the previous experiments referred to indicated that a tearing stress, equivalent to 80,000 lbs. per square inch, could be applied without rupturing the metal.

Crushing Strength.—Several specimens were tested by crushing in the testing machine. The tendency of most of the pieces, when failing in compression, was to make a succession of folds, forming regular rings, which were formed without splitting or tearing of the metal in any way.

In the discussion objection was made to the indefiniteness of the terms "annealed" and "unannealed" as used in the paper, and to the lack of information given regarding the details of the treatment of the steel before it was tested. Referring to the compression tests, Mr. Henning showed the four conditions which always takes place in such cases, the first being a bending represented by a single curve extending the entire length of the test piece, the second a bulge at or near the center, the third

*Analysis of steel employed is claimed to be as follows: Carbon 0.08 to 0.10, manganese 0.45, phosphorous, 0.09 to 0.110. sulphur 0.04 to 0.05, silicon 0.009.

where it begins to take the S shape, and the fourth where this last-named condition is exaggerated somewhat. The reason for this action of metals is well understood, and is explained mathematically in some of the text books.

At the conclusion of the discussion the Secretary read the formal resolutions, thanking, in very appropriate words, those who had been instrumental in making the time pass pleasantly while at Niagara Falls, especially the Engineers' Society of Western New York, which had charge of all the local arrangements. The announcement was then made that the meeting next Spring will probably be held at Cincinnati. The register showed that about 350 were in attendance.

On Friday afternoon and Saturday morning some of the members visited many of the well-known shops and manufacturing establishments in and near Buffalo, including the Wagner Sleeping Car Works at Depew. The Brooks Locomotive Works also extended a cordial invitation to the members to visit them at Dunkirk, N. Y. Those who took this trip had the opportunity of studying the problem of relative merits of electricity and compressed air in driving tools and machinery, some description of which was given in our issue of Sept. 24, 1897.

Spring and Equalizer Action in Locomotives.*

By A. Von Borries.

In consequence of inequalities in the track and to prevent the transmission to the vehicle of shocks (resulting from the rolling of the wheels on the rails) between the journal boxes and frame are interposed springs, which yield vertically. To make the loads upon these springs as nearly uniform as possible—a particularly desirable condition in locomotives—they are connected in various ways with one another by equalizing levers.

As regards the influence of springs and equalizers upon the safety of the progress of a locomotive, it is clear, without further argument, that the less the variation of pressure of the wheels—particularly the leading wheels—upon the rails the safer the motion.

If s denotes the amount of deflection which a spring, with coefficient of flexibility (nachgiebigkeit) e, experiences under a load P, — internal friction of the spring being neglected—then, $s = eP$ and the energy expended (work done) in the deflection will be $U = \frac{Ps}{2} = \frac{s^2}{2e} = \frac{e}{2}P^2$ or

$$(16)\quad P^2 = \frac{2U}{e};\ s^2 = 2eU.$$

If, furthermore, P_o be the statical load and s_o the corresponding deflection, U the amount of energy produced, or absorbed by a varying load P, then

$$(17)\quad P^2 - P_o^2 = \frac{2U}{e};\ s^2 - s_o^2 = 2eU.\dagger$$

From these relations, it follows that any increase or decrease in pressure upon a spring produced by a certain action is less, with a greater deflection, the more flexible it is. It is, accordingly, safe to conclude that the pressure on the wheels of a locomotive will be more uniform the more flexible the springs; that a locomotive with flexible springs, in spite of the greater tendency to sway, will run with greater safety than it would if equipped with stiff springs.

Flexible springs are unqualifiedly to be preferred, from considerations of both comfort and durability; the slow swinging which here ensues is of little moment compared to the deleterious effects of the constant and furious jarring induced by stiff springs on human nerves and the locomotive's structure.

To understand the influences of oscillations (Schwingung) on the safety of an engine's motion, it will be necessary to study this motion, first, by itself; then under the effect of springs, assumed to be separated from or independent of each other.

As the leading axle runs over an inequality it rises or falls, the stress in the springs is changed and the forward end of the locomotive in endeavoring to follow the movement induces an alteration in loads upon the remaining axles. As the center of gravity has been displaced in the direction of the jolt on the first axle, the effect of the inequality on the others will be less and least upon the trailing axle. This action is especially marked when independent springs are used.

Take, for sake of simplicity, a three-axled locomotive, n which the wheel-spreads $\frac{a}{2}$ and axle loads P_o are equal; let, furthermore, $P-P_o$ be the increment of load on one and decrement on the other end axle produced by a turning moment M‡ (Schwingungs moment), then for each pair of springs the work performed in the oscillation $\frac{M}{2} = U$, and the unloading of the springs in one case, the loading in the other, will be according to (17):

$$P^2 - P_o^2 = \frac{2}{e}U = \frac{2}{e}\frac{M}{2} \text{ or } (18)\ e\,(P_2 - P_o^2) = M$$

That is, in pitching, the alteration of wheel loads is independent of the wheel base a and less the greater e or the more flexible the springs. Also, according to (17):

$$(19)\quad \frac{1}{e}(s^2 - s_o^2) = M.$$

Consequently, the turning moment induced by an inequality $s - s_o$ is also independent of the wheel base and less the more elastic the springs. Combining (18) and (19) gives:

$$(20)\quad s^2 - s_o^2 = e^2(P^2 - P_o^2).$$

That is, an alteration of wheel loads produced by an inequality $s - s$ is independent of the wheel-base and is less the more flexible the springs.

A longer wheel-base, therefore, affects sensibly only the amplitude of the oscillation without increasing either the safety of running or the life of the superstructure. It is only when the period of the locomotive's oscillation agrees with the time which it takes to traverse a rail length, that safe running can be endangered by an accumulation of these pitching movements and thereupon require a lengthening of the wheel-base. With present rail lengths and a wheel-base settled by other considerations, such a contingency is practically excluded.

In ordinary leaf springs internal friction, due to the ends of the leaves rubbing on one another, increases with the number of the leaves. This friction opposes in a most effective manner the augmentation and continuance of pitching.

If the springs of the first and second axles of a three-axle locomotive are connected by side equalizers, a change in load will affect both simultaneously. Any inequality in the track affects the locomotive to its full extent only after both axles have passed it. If the speed is so low that the locomotive can respond to the action of the leading axle before the second is affected, the effect is only half as great as it would be with independent springs. At higher speeds, the second axle is affected before the pitching induced by the leading axle has ceased, but there is a diminution in the combined action, because the first effect has partially spent itself in the interval of time which occurs between the two. The benefit of this combined action is lost when independent springs are used.

If $P-P_o$ represents the change in the load on each of the two axles equalized, produced by the turning moment M, which will make that of the third axle with independent springs $2(P-P_o)$, the work performed on all the springs will be

$$2\frac{e}{2}\left(P^2 - P_o^2\right) + \frac{e}{2}\left([2\,(P - P_o) + P_o]^2 - P_o^2\right) = M \text{ or}$$

$$(21)\ M = e\,(3P^2 - 2PP_o - P_o^2).$$

If M be $e\,P_o^2$, or in other words, if the turning moment be such as to completely unload the trailing axle, then (22) $P = \frac{1}{3}P_o$. That is to say, both the springs connected by equalizers under a pitching oscillation which would entirely unload the independent springs still retain one-third of their mean load*. Similar advantages obtain from the use of equalizers in 4 or more axled locomotives.

Since the leading axle should carry a load as nearly constant as possible, its springs and those of the middle axle should always be connected by equalizers. But instead, the main and trailing axle springs are often equalized, which, though it equalizes the loads upon these axles, is of greater disadvantage to the leading axle than no equalization at all. Besides, this arrangement, by loading or unloading both the axles simultaneously, when pitching occurs, more readily induces a sluing of the drivers; this does not occur in the design for 3-axled locomotives recommended to and adopted by the Prussian State railroads. It has been assumed heretofore that the same inequalities occur in opposite rails at the same time. If this is not the case, besides the pitching fore and aft, a lateral swaying will arise.

Every lateral sway, caused by a one-sided inequality in the track, begins when the first axle with side springs feels that inequality; it ceases when the last axle of this sort has crossed the inequality; axles with cross springs or cross equalizers have no effect on this motion. Swaying is slower the longer it takes the former axles to pass the inequality. At speeds so slow that the effect can be confined to single axles, swaying is not noticeable. As the speed increases, however, the effect is manifested in the second before that induced by the first axle has disappeared, and continuity of action results. When the second axle runs onto the inequality before the sway induced by the action of the first axle has reached its maximum velocity, i. e., has completed one-quarter of a complete oscillation, the accumulated action becomes violent, and under certain circumstances even dangerous. Swaying increases with a further increase of speed, but in less proportion. If there are more than two axles with side springs, the swaying will be, likewise, the resultant of the several individual actions; since the period of the latter is, however, independent of the number of axles, although the amplitude and maximum velocity of oscillation is less the smaller the load on the spring, it is a matter of indifference, as far as the total movement is concerned, whether it originates from two strong or more weaker actions. Therefore, the conclusion is, that swaying becomes serious, when the time consumed in crossing an inequality in the track by the axles with side springs is equal to, or less than one-quarter of the complete period of the locomotive's oscillation.

This period of oscillation depends, on the one hand, on the moment of inertia of the locomotive about a horizontal and longitudinal axis, on the other, on the stiffness of its springs and their distance from the same axis, and can be easily determined; whenever rotation of the drivers accords with the fourfold period of oscillation—because the thrust of the crossheads upon their guides changes four times in a rotation—swaying will increase perceptibly.

In the case of the standard passenger locomotive of the Prussian State Railway, which is supported, theoretically, at three points by a cross equalizer between the springs of the back axle and side equalizers between the front and main axle springs—about 70 per cent. of the total weight being carried by side (i. e., not cross-equalized) springs lying inside the wheels—this increase will occur when the drivers are making about 1 R. P. S.; the period of its oscillation, that is, the time of a single sway is accordingly, in round numbers, .25 sec. This becomes larger, the smaller the ratio of the force of the springs to the moment of inertia, hence the smaller the ratio of the weight carried on the side springs to the whole weight, and the motion continues to increase or decrease, circumstances otherwise remaining equal, inversely as the square root of that ratio. In this locomotive, whose axle spread is 6.56 ft. (2 m), severe swaying will occur; therefore, when it crosses a one-sided inequality in the track at a speed of $\frac{6.56}{.125} = 52.5$ ft. per sec. = 35 m. p. h. approx.

A four-axled locomotive with swivel truck, whose driving axles with a spread of 8.2 ft. carries about 60 per cent. of the total weight on side springs, would have about a .28-sec. period of oscillation, provided the truck bears only at the swivel, therefore serious swaying must appear at $\frac{8.2}{.14} = 58.5$ ft. per sec. = 40 m. p. h.; if supported at four points, however, the period becomes .22 seconds, the axle-spread, the driver base of 24.6 ft. and swaying would occur at $\frac{24.6}{.11} = 223.6$ ft. per sec. = 152 m. p. h.

The severest swaying does not ordinarily appear immediately in consequence of a one-sided inequality in the track alone, but in consequence of rolling, or a simultaneous lateral and vertical yielding of the rails. It is therefore especially important to recognize and to control, within limits, the loading and unloading of the springs caused by swaying arising from other sources. If, in such a case, M_1 be the turning moment, $P-P_o$, the loading of the springs on one side and the unloading on the other, then

$$(23)\ \frac{e}{2}n\,(P^2 - P_o = U \text{ is the work performed on or by n}$$

springs on one or the other side, and since $U = \frac{M_1}{2}$ then (24) $n\,e\,(P^2 - P_o^2) = M_1$. Therefore, the variation in load due to swaying is less the greater the flexibility e of the spring, and the larger the number n of the springs - not cross-equalized—working together.

Since swaying acquires significance only at the higher speeds, as has been shown, cross-equalizers should not be used in passenger locomotives. For low speed locomotives, in which this peculiar movement rarely appears, cross equalizing of the statical loads on the springs is, on the other hand, quite desirable.

The following rules are based on the above discussion:

(1) The springs should be as flexible as possible to

---

*The translator will endeavor to maintain the author's distinction between the following terms: Schlingern, a peculiar "rolling," fully described in the third article, and distinct from Seitenschwankungen (Schwingung), etc., a "swaying" athwart the track.
Nickende Schwingung, Nicken, etc., a "pitching," fore and aft.

These articles are extracts from an important work, "Die Eisenbahn-Technik der Gegenwart," selected and translated for "The Railroad Gazette" by Mr. W. W. Nichols, Instructor in Mechanical Engineering in Yale University. Mr. Von Borries, as very many of our readers know, is Mechanical Chief of the Hanover "Direction" of the Prussian State Railroads.

See pp. 19, 114 and 323 for earlier articles.

[†The great difference between the significance of U in (16) and (17) makes the latter obviously inconsistent.—Trans.]

‡[The author is even more definite—assuming M to be the "turning moment" through whose agency certain effects are produced. The connection between M and U, which follows, is, in the translator's opinion, far from being clear. The author's conclusions drawn from equations (18) and (19) seem to indicate a confusion of ideas. Turning Moments and Work, although in the same terms, are very different conceptions and have no direct connection with each other; there is a marked distinction between these units, pound-foot and foot-pound. The author's conclusions are doubtless justified, but his logic in this instance can be criticised.—Trans.]

*[The author is surely at fault here. $P = \frac{1}{3}P_o$ will not only fail to satisfy (21), but implies an impossibility in the original hypothesis. With $M = e\,P_o^2$ in (21) P becomes either $1.21\,P_o$ or $-.55\,P_o$. The former seems reasonable; just what the latter means cannot be determined under the circumstances. If, however, $M = -e\,P_o^2$, which attaches an added significance to the symbol M_o then P will become $\frac{2}{3}P_o$ or 0, which would be more within the range of possibility, and implies an addition of load upon the depressed springs exceeding the subtraction from the unloaded spring by an amount which may be the measure of the force of momentum. In any event, all reverts to the first question, what is "M"?- Trans.]

limit the variation in wheel loads. Spiral springs are unsuitable for end axles.

(2) The springs of the first and second axles should be connected by side-equalizers in order to reduce to a minimum variation in load upon the leading axle. In four or more axled locomotives springs of the third and succeeding axles should be connected in the same way for the same reason.

(3) In locomotives running at moderately high speeds cross-equalizers should be used in connection with side-equalizers, so as to provide support at three points in order that a static equalization may ensue.

TECHNICAL.

Manufacturing and Business.

Lucian Eaves, 11 Broadway, New York City, wishes to correspond with makers of wire rope tramways for use in extensive copper mines in the West about to be developed.

The Wilmot & Hobbs Manufacturing Co. of Bridgeport, Conn., is making additions to its plant, which consist of two buildings, to be used as an engine building, and a machine building. The engine and plating building will be about 60 ft. wide and 100 ft. long; two stories high, steel frame construction, with brick side walls and concrete floors. The machine building will be about 80 ft. long and 135 ft. wide, and three stories high. This building will be of steel skeleton construction throughout. The floors are designed for heavy loads, and will be carried on corrugated iron arches supporting concrete filling. The designs of the building were made by the Berlin Iron Bridge Co., who will furnish and erect the structural steel work.

The American Brake Shoe Company, owners of the Diamond S. brake shoe patents, announces the following licenses and guarantees the uniformity of the product of each of these licensed makers: The Sargent Company, Chicago, Ill.; the Ramapo Iron Works, Hillburn, Ky.; Parker & Topping, St. Paul, Minn., and Portland, Ore.; Central Brake Shoe Company, Buffalo, N. Y.

Edward E. Gold, Frankfort and Cliff streets, New York City, owners of the patent gate lock used on the Manhattan Elevated Railroad of New York and on the Illinois Central and many other roads, has closed a contract to equip the cars of the Brooklyn Elevated, Long Island and Metropolitan Elevated (Chicago) railroads.

At a recent meeting of the Laconia Car Co., of Laconia, N. H., Dennis O'Shea was elected a Director, to fill the vacancy caused by the death of Charles B. Gafney.

The American Brake Shoe Co., owner of the Diamond "S" brake shoe patents, has been formed to maintain a careful inspection of the product of all licensees under the Diamond "S" patents, insuring uniformity and a continuance of the good results obtained from the Diamond "S" shoes made by the Sargent Co. It is also intended to provide for inspection of brake shoes in service. The following licensees are now prepared to fill orders, and the American Brake Shoe Co. is in a position to guarantee that their product will be of uniform excellence: The Sargent Co., Old Colony Building, Chicago, Ill.; Security Building, St. Louis, Mo.; Endicott Arcade, St. Paul, Minn., and 537 Mission street, San Francisco, Cal.; Ramapo Iron Works, Hillburn, N. Y., and Havemeyer Building, New York City; Parker & Topping, Endicott Arcade, St. Paul, and Albina Foundry, Portland, Ore., and Central Brake Shoe Co., Ellicott Square, Buffalo, N. Y., and Havemeyer Building, New York City.

The offices of the National Railway Specialty Co., Chicago, have been moved to Number 1474, Old Colony Building, Chicago, Ill.

The Chambersburg Engineering Co. has received an order from the Pittsburgh Locomotive Works for a large hydraulic riveting plant and for a 20-ton hydraulic crane to handle the work to be done by the riveter. The riveter, which is to be used for putting rivets into boilers of heavy type, will weigh, when completed, 80,000 lbs., will stand about 16 ft. above the floor line, and will extend 9 ft. below the floor. This company has just made a shipment of its new type of automatic engines, and is completing a large hydraulic riveter for the Schoen Pressed Steel Co. of Pittsburgh.

F. M. Hicks, of 225 Dearborn street, Chicago, is offering for sale two 15x24 six-wheel switching locomotives, two 15x24 eight-wheel locomotives and three 15x24 four-wheel locomotives.

Iron and Steel.

On June 5 a blast furnace explosion occurred at Colebrook furnace No. 1, operated by the Lackawanna Iron & Steel Co. at West Lebanon, Pa. Several men were injured, but no lives were lost. Buildings were set fire to by the explosion, and it is stated that the loss is considerable.

The Navy Department has opened bids for two sets of steel forgings for 8-in. guns. Bids were received from the Bethlehem Iron Co. and Midvale Steel Co., each at 23 cents a pound. The Bethlehem Company promised to furnish forgings in from 40 to 65 days and the Midvale Company in from 50 to 70 days.

According to reports, the Shelby Tube Co. will double the capacity of its plant at Greenville and will employ about 200 more men. About $200,000 is to be spent on improvements.

New Stations and Shops.

The Chicago & Northwestern is building a two-story brick freight house in Chicago, on Meagher street, between Jefferson and Canal streets, which will be completed as soon as possible. It will be 464 ft. long, 38 ft. wide, and will cost $20,000. The plans were prepared by Frost & Granger, Architects.

The Railroad Commission has approved an issue of $64,000 worth of bonds for the building of a Union passenger depot at Galveston, Tex.

The Directors of the Union Depot Co. of Kansas City, Mo., has adopted plans for remodeling the depot. The limit of the cost was fixed at $30,000. Bids for the work will be advertised for at once.

Car Heating Lawsuits.

Last week under this heading we noted the decision in the U. S. Circuit Court, Southern District of New York, for the Consolidated Car Heating Co. against the Gold Car Heating Co. A preliminary injunction was granted restraining the Gold Company from making or selling its new style electric car heater, but the injunction is suspended until Nov. 1. It is of considerable interest to note the reason given by the judge for suspending the injunction and we quote that part of the decision: "The device of defendants is obviously a close mechanical equivalent, differing in form, but accomplishing the same result in the same way. It seems, however, to be a better arranged and more efficient device and a distinct improvement upon the patent in suit. In consideration of this latter circumstance, the injunction to which complainant is entitled, will be suspended till Nov. 1 upon defendant's giving bonds in the usual form for $10.000 in each case and filing sworn accounts of sales monthly."

Cattle Guards.

A committee of the Association of Bridges and Buildings has issued the following circular. Replies should be sent to the chairman, Mr. C. C. Mallard, Southern Pacific Company, Algiers, La.:

At the last meeting of the Association of Railway Superintendents of Bridges and Buildings the undersigned were appointed a committee to report at our next meeting on "Cattle Guards and Wing Fences." In order to make our report as complete as possible we are anxious to present a collection of the plans of every kind of cattle guard and cattle guard wing-fences in use in this country. You will, therefore, aid us very materially if you will kindly send to our chairman blue prints, cuts or tracings of the standard designs adopted and in use by your company, and, if you see fit to do so, give the reasons for their adoption. We would also like to get from you an expression of opinion as to the points to be considered in the proper designing of a cattle guard and its wing-fences.

Slate Tests at Lehigh University.

In the civil engineering laboratory of Lehigh University a series of tests on the roofing slates of Pennsylvania has recently been completed, the results of which will be shortly published. These tests cover the properties of density, softness, strength and resilience, as well as the injurious qualities of porosity and corrodibility. Sufficient specimens from each of the five slate regions of Pennsylvania have been tested to enable the salient characteristics of their slate production to be definitely stated in numerical form. It has been shown that for all the soft slates the qualities of softness and resistance to corrosion are closely connected with each other, while for both soft and hard slates resistance to corrosion are likewise related.

Electric Lights for Locomotives.

Mr. Frank Rearden, Superintendent of the Locomotive and Car Departments of the Missouri Pacific, has fitted up two passenger engines so that electricity instead of oil is used for all lighting on the engines. One of these engines runs between St. Louis and Sedalia, and one between St. Louis and Poplar Bluff. These engines, in addition to a Pyle-National electric headlight and generator, have each 17 incandescent electric lights, arranged as follows: Three lights are placed in the cab, four under each running board, two under the barrel of the boiler, one being placed between the eccentrics and one directly over the links; two over the front truck and two classification lights on the front end. Dressel lamps are used for the front markers, as they are so made that either electric or oil lights can be used. The cab classification lights are burned continuously when needed, but the other lights are controlled by a switch in the cab, and are used only when needed for oiling or inspection. A single generator, such as was illustrated in our issue of March 12, 1897, furnishes the current for all the lights, and we understand that other engines are soon to be fitted up in the same way.

Meadow Sod for Embankments.

Atlantic City (N. J.) newspapers report that the West Jersey & Seashore Railroad is surfacing the sides of embankments in the meadows near that city with sod a foot thick, which is gathered near the line of the road. We learn from an officer of the company that this method of repairing and protecting embankments has been employed for about a mile-and-a-half where the embankments are washed by the tides, but that the success of the experiment is not yet settled. A considerable part of the material dug out of the swamps is composed of roots and vegetation, which, when dry, are so light that detached shovelfuls float away with the tide.

An embankment near the bridge over Townsend's Inlet was repaired with mud six or seven years ago and the bank has stood well, but in this case the mud was thrown up by a dredge, working in a ditch made by itself alongside the road. This bank had before been frequently washed away by storm tides. The dredging boat had a long boom by which the mud was deposited exactly where it was wanted.

Electric Motors on the Kings County Elevated.

The Kings County Elevated Railroad of Brooklyn has ordered 41 passenger cars, to be built by the Wason Mfg. Co., Springfield, Mass., and 20 of these cars are to be equipped with electric motors, four motors on each car, by the Westinghouse Electric & Mfg. Co., as noted in our issue of April 29 last. The trucks will be made by the Baldwin Locomotive Works. This electrical equipment is put on to prepare the cars for running over the bridge to New York. The Kings County road has not yet made any arrangement for electrical conductors along its tracks or for a power house.

Bids on Steel Pipe for Australia.

The Government of Western Australia is advertising for bids for the supply and delivery in Western Australia of about 246 miles of riveted steel pipe of about 31 in. internal diameter. The form of tender with drawings, specifications and conditions of contract may be obtained on payment of a fee of two guineas in Europe at the office of the Agent General for Western Australia, 15 Victoria street, Westminster, London, S. W.; in America, at the office of Seward, Guthrie & Steele, 40 Wall street, New York, and in Western Australia, at the office of the Honorable the Director of Public Works, Perth. Tenders will be received until noon on Tuesday, Aug. 23, 1898.

The New East River Bridge.

The Board of Estimate of New York City has authorized the issue of bonds to pay for work on the new East River bridge (and for land acquired), to the extent of $2,487,824. The letting of contracts has been held up for some months because of the remarkable decision of the city authorities that the debt limit of the city had been reached. The decision now reached to issue bonds will, we suppose, not result in the immediate issue of a call for more bids, as considerable money is needed to pay bills accrued and for work now under contract. But it is likely that further action will be taken very soon to provide for additional contracts.

Knitted Padding for Car Seats.

The Knitted Mattress Co., of Canton Junction, Mass., has recently issued a circular relative to the increase in the use of its knitted padding in place of curled hair for car seats and backs. Testimonials have been received from a number of railroads, including the Western Maryland, Delaware, Lackawanna & Western and International & Great Northern, all of which vouch for the saving in upholstering and for its superiority over curled hair, in some respects, in actual service.

Public Works in New York.

The Board of Estimate of New York City on Tuesday of this week authorized the issue of bonds to the amount of $23,356,755. These bonds are to pay for public works of various kinds, many of which are now well under way. Among the works that will be relieved by this issue are new schoolhouses to the amount of $2,300,000; City Island bridge, $215,000; Third avenue bridge, $250,000; additions to the Metropolitan Museum of Art and the Museum of Natural History, $1,250,000; First avenue bridge over the Harlem, $1,483,000; bridge at 145th street, $1,150,000; Elm street widening, $2,296,090; repaving streets and avenues, $1,500,000; new East River bridge, $2,488,000; Willis avenue bridge, $154,845; a large sum for the Croton aqueduct and reservoir, and considerable sums for buildings and parks not mentioned above.

A Reported Steel Combination.

A great deal has been said in the newspapers recently in regard to a combination which is reported being formed by the Rockefellers, Andrew Carnegie, J. Pierpont Morgan and others. According to these reports the plan is to consolidate the large steel manufacturing plants of this country. Charles H. Coster, who is a member of the firm of J. P. Morgan & Co., has recently been elected a Director of the Illinois Steel Co., and the newspapers claim that this is one of the moves toward consolidation. English money is to be invested through J. S. Morgan & Co., the London representatives of J. P. Morgan & Co. Some of the corporations to be taken into the deal are the Bethlehem Iron Co., Ohio Steel Co., Carnegie Steel Co., Ltd., Scranton Iron Co., Lackawanna Iron & Steel Co. and the Minnesota Iron Co.

Westinghouse Brakes in Russia.

Mr. Geo. F. Evans, General Manager of the Canada works of the Westinghouse Air Brake Co. will sail the last of this month for Russia to establish and start a plant for making air brakes in St. Petersburg. He will retain his position with the Canadian works.

THE SCRAP HEAP.

Nicaraguan Contract with the Pacific Mail Steamship Co.

The Government of Nicaragua has made a contract with the Pacific Mail Steamship Co., which went into effect Jan. 1, whereby the Central American line of steamers between Panama and Champerico is to make one trip monthly, calling, coming and going, at the ports of San Juan del Sur and Corinto, and at the principal ports of Central America. The Mexican line between Panama and Acapulco is to make one trip monthly, calling, coming and going, at the same ports, including those of Mexico, making connection at Acapulco with steamers that go to San Francisco and the northern ports of Mexico. The steamers are to carry freight, passengers and mails. The Steamship Co. will receive from the Government 9,000 pesos ($3,681) annually in legal silver, and engages to carry Government employees and freight at a reduction of 25 per cent.

Texas Transport & Terminal Co.

This company, which has been in operation for some years, and now doing business from Galveston, Tex., loading a number of steamers on regular lines to various European ports, including Liverpool, Hamburg, Havre, Bremen, Rotterdam, Genoa, etc., was reorganized April 5. The T. T. & T. Co. has made an arrangement with Charles F. Orthwein & Sons (also operating steamers) under which both concerns will hereafter be operated as one line. The company is also shortly to operate an additional line from New Orleans. W. P. Ross is Traffic Manager, with office in New Orleans. Simpson, Spence & Young, New York, are the General Managers. Reference to this company is made in the Election Column.

Cost of the Siberian Railroad.

The following, bearing date April 29, 1898, from Moscow, has been received from Consul Smith:

The committee of the Siberian Railroad recently held a meeting and rendered its accounts, which contained the following data of expenditures incurred from 1893 to 1897, showing the total cost of the construction of the great Siberian Railroad:

	Rubles.	
Western Siberian, without Baikal branch	50,743,111	$25,371,555
Central Siberian	97,766,591	48,888,295
Branch line of Ekaterinburg-Cheliabinsk	6,535,258	3,267,629
South Ouroussisk branch	22,416,284	11,208,142
North Ouroussisk branch	22,461,130	11,230,565
Irkutsk-Baikal branch	2,405,914	1,202,957
Steam ferry across the Lake Baikal	3,404,171	1,702,085
Zabalkalski Railroad	72,447,186	36,223,593
Tomsk branch	2,609,765	1,304,882
Onon branch to the Chinese frontier	32,727,600	16,363,800
Nieolski branch to the Chinese frontier	8,811,120	4,405,560
Perm-Cotlass branch	36,513,886	16,256,943
Supplementary expenditures	21,167,865	10,588,932
Total expenditure	271,009,947	$188,014,938

Out of the above amount, there has been already advanced 325,991,320 rubles ($162,995,660). Besides this, there have been expended for topographical and astronomical works, irrigation, surveying, geological researches, agricultural implements, etc., the sum of 11,957,327 rubles ($5,978,663.50).

The Latest Idea of the G. P. A.

The advertising manager of a prominent railroad running into Washington, D. C., has prepared a souvenir for patrons of the road, consisting of a compass in a neat brass case about two inches in diameter; beneath the needle is printed a miniature map of Washington, on which is specially marked the location of the station of the road issuing the advertisement.

An Explosion of Acetylene Gas.

Frank S. Hastings, of New York, private secretary to E. C. Benedict, was very gravely injured by an explosion of acetylene gas at his house in the country on the 29th of May. Mr. Hastings went to his wine cellar with a lighted match in his hand. A heavy explosion immediately took place, and he was thrown to the floor. The force of the explosion wrecked the wine cellar, and a side of the kitchen above was blown out. The house is lighted by acetylene gas.

Engineering Works at Chicago.

The new water tunnel at Sixty-eighth street, Chicago, was accepted by the city May 27, and on the 28th water from the new two-mile crib was turned into the mains. This improvement will increase the tunnel capacity of the Hyde Park pumping station 14,000,000 gallons a day, and will give pure drinking water to the Hyde Park district. Plans for the extension of this tunnel to a new modern crib were made two years ago, and it has cost the city about $100,000 to complete the work. The tunnel has twice caved in, and many difficulties have delayed the contractors in pushing the work. The new 14,000,000-gallon pump is now being installed at the Hyde Park station, and with the large water mains about to be laid, and the completion of the intercepting sewer system, this district will have an ample supply of pure water for many years to come.

The city of Chicago has refused the offer of the Illinois Central of a perpetual lease at a nominal rental of a site east of its tracks at Thirty-ninth street for a pumping station for the Thirty-ninth street conduit of the new intercepting sewer system. The city law department has reported that the railroad has no title to the land, and the city could not accept the lease without establishing a precedent regarding land which may be filled in in the future. The Illinois Central claims ownership of the site in question, and the claim not being acknowledged by the city, the matter will have to be settled by the courts. The City Council several weeks ago authorized an expenditure of $40,000 for a piece of land at the foot of Thirty-ninth street, just west of the Illinois Central and east of Lake avenue, to be used as a pumping station for the sewer conduit, and this site will probably be used, although there is much opposition on the part of the owners of fine residence property on Lake avenue and adjacent streets.

Bids for the construction of the By-pass at the Pennsylvania tracks at Chicago are being opened by the Board of Trustees of the Chicago Sanitary District, as we go to press, and contract for the work will be let in a few days. About 1,500 tons of material will be required and the work will cost $100,000.

Lake Notes.

The new passenger steamer "Georgia" of the Goodrich Transportation Co., mentioned last week, was put in regular service June 4 between Chicago and Manistique, Mich. She will leave Chicago every Saturday night, arriving at Manistique every Wednesday morning, and making numerous intermediate stops. The Georgia was built by Burger & Burger, at Manitowoc, Wis., and is designed for both summer and winter travel. She is 206 ft. long and 34 ft. wide inside bulwarks, with accommodations for 150 passengers and 800 tons of freight. There are wide promenades, a reading room, cafe, smoking room, bath rooms, barber shop, electric lights, and all modern conveniences, including running water in all the staterooms. There is also a large reception room on the main deck, similar to those on ocean steamers. The dining room, forward, has seats for 75 people.

The steamer "Presque Isle," launched May 25 at the yards of the Cleveland Shipbuilding Co., will be completed about June 15 for the Presque Isle Transportation Co. The dimensions are: 426 ft. long over all, 406 ft. keel, 50 ft. beam and 28 ft. deep. Quadruple expansion engines and Babcock & Wilcox water tube boilers will be used and the boat will cost $20,000.

Press reports state that the steel shipbuilding plant of F. W. Wheeler & Co., of West Bay City, Mich., has been turned over to the Bessemer Steamship Co., of Cleveland, to be operated until the steamer and two schooners now building for the Bessemer Company are finished. (See Railroad Gazette Oct. 22, 1897, p. 751.) The Wheeler Co. lost money on this contract, having bid for the boats under sharp competition on the basis of the price of steel last October, since which time there has been an advance in material and in labor.

The lake steamer lines of Chicago, which carried 1,000,000 passengers last year, estimate that the travel this year will reach 1,500,000 or more. Some steamers have already booked more business for June and July than for the whole season of 1897. Low rates and better steamer accommodations are given as reasons for the larger lake business indicated.

The steamer Superior City delivered at the Illinois Steel Co.'s docks at South Chicago June 5 a cargo of 6,800 net tons of iron ore, the largest cargo ever carried on the lakes. The largest previous load was 6,500 net tons of corn taken by the steamer William R. Linn from South Chicago, as noted in this column at the time. The Superior City is the largest steamer on the lakes, and will now load corn at South Chicago. It is expected that she will break the grain as well as the tonnage record.

Armour Institute of Technology, Chicago.

Announcement was made last week that Mr. P. D. Armour has made an additional gift of $500,000 as an endowment fund, the income to be used in extending the work of the institute. Originally accommodations were prepared for 300 students, but 700 applied for admission, and the number has increased until more than 1,100 are now enrolled for regular instruction. The first endowment gave an annual income of $50,000, and in addition $25,000 has been received annually from tuition and fees, but the annual expenditure is now $100,000, and the additional gift has been made to provide for the deficiency. The increased expenses have been mainly in the electrical and mechanical engineering departments, and it is said that the larger income will be used in increasing the faculty and not for new buildings.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works are building one engine for Brazil.

The Northwest, a new broad gage railroad (see Railroad Construction column), will need a few locomotives.

The Baldwin Locomotive Works have received an order to build one six-wheel locomotive for the Allegheny Iron Co.

The New Mexico Railway & Coal Co. has placed an order with the Baldwin Locomotive Works for one 12-wheel tank engine.

As we go to press the Louisville & Nashville is about to place an order for 15 consolidation engines, with 21x26-in. cylinders.

The order for locomotives for the Fremont, Elkhorn & Missouri Valley, mentioned in our issue of May 27, has been increased from 10 to 15.

The Hutchinson & Southern has placed the order for the two engines referred to in our issue of March 11 with the Manchester Locomotive Works.

The Fitchburg has placed the order for the two 10-wheel passenger engines referred to in our issue of May 27 with the Baldwin Locomotive Works.

We understand that the Mexican Central will order between 30 and 40 more engines, and that the order will likely go to the Brooks Locomotive Works.

We are reliably, but not officially, informed that the Northern Pacific has placed an order with the Schenectady Locomotive Works for 20 mastodon locomotives.

The Chicago, Milwaukee & St. Paul has ordered 10 ten-wheel compound engines from the Baldwin Locomotive Works, and will probably order immediately 10 switchers.

The Baltimore & Ohio has placed an order with the Pittsburgh Locomotive & Car Works for 10 consolidation engines. They will have 20x28-in. cylinders. The road will also buy 15 or 20 more freight locomotives, probably from the Baldwin Locomotive Works.

The Illinois Central has placed an order with the Brooks Locomotive Works for five 6-wheel switchers, with 19 in. x 26 in. cylinders, and seven 10-wheel freight engines, and with the Rogers Locomotive Co. for four 10-wheel passenger engines, with 19½ in. x 26 in. cylinders, and nine 10-wheel freight engines, making 25 in all. The freight engines will all have 20 in. x 28 in. cylinders.

The 17 engines ordered from the Richmond Locomotive & Machine Works by the Finland State railroads, and referred to in our last issue, will be of the mogul type, 5 ft. gage, and weigh 60,000 lbs. with 51,000 lbs. on the drivers. They will have 16 and 25 x 20½ in. cylinders; 50-in. driving wheels; radial stay boilers; 170 lbs. working steam pressure; fireboxes, 48 in. long and 38 in. wide; copper fireboxes and stays, brass tubes, cast steel wheel centers and driving wheels and four-wheel tenders.

In our issue of May 20 we referred to an order given by the Southern Pacific to the Cooke Locomotive Works. They will be 10-wheelers, and weigh 143,000 lbs., with 108,000 lbs. on the drivers, and have 20x26-in. cylinders, 63-in. driving wheels, wagon-top type boilers, with a working steam pressure of 180 lbs.; fireboxes, 77 in. long and 32¼ in. wide, and tank capacity for water of 4,000 gals. and for coal 10 tons. They will be equipped with Westinghouse-American brakes, Southern Pacific standard steel brake beams and Christie brake shoes, Janney couplers, Leach sanding devices, Nathan lubricators, French springs and Latrobe tires.

The 10 locomotives being built by the Rogers Locomotive Co. for the Texas & Pacific and referred to in our issue of May 27, will be 10-wheel freights, and weigh about 128,000 lbs., with 98,000 lbs. on the drivers. The principal dimensions are: Cylinders, 19x24 in.; driving wheels, 57 in. diameter; boiler, extended wagon top type, with working steam pressure of 190 lbs.; firebox, 102 in. long, 33½ in. wide; tank capacity, for water 45,000 gals. and coal, seven tons. The engines will be equipped with Westinghouse-American air brakes, Gould couplers, 8¼x9½ in. Otis steel axles, Pyle National electric headlights, U. S. metallic piston and valve rod packings, two Coale muffler safety valves, Houston double sanding devices, Nathan lubricators, Pickering springs and Standard tires.

The Missouri Pacific has ordered 25 10-wheel freight engines, 15 from the Rogers Locomotive Co. and 10 from the Cooke Locomotive Works. All details have not yet been definitely decided. The following dimensions cover those to be built by the Rogers Locomotive Co., and we presume the others will be similar: Cylinders, 20x24 in.; wheel base, rigid, 12 ft. 6 in., total 23 ft. 4 in.; boilers, extended wagon-top type, 60 in. in diam. at smokebox; firebox, 102 11/16 in. long, 40⅜ in. wide, 76¼ in. deep at front and 66 in. at back; flues, 282, outside diam. 2 in., and 13 ft. 5 in. long; grates, cast iron rocking; driving wheels, 60 in. outside diam., made of cast steel, and front and back of cast iron; trucks, four-wheeled, rigid center; truck wheels, 30 in. outside diam., cast iron spoke centers, steel tires; driving and truck axles of hammered iron, the former 8¾x11½ in., and the latter with 6x12-in. journals; tender, eight-wheeled, with frame of 10-in. channel steel and steel tank of a capacity for 4,000 gals. of water and eight tons of coal. The engines will be equipped with Westinghouse driver, tender and train brakes, Houston double-track Sanders, Nathan injectors, U. S. metallic piston and valve rod packings, Crosby muffled safety valves, and Latrobe tires.

CAR BUILDING.

The St. Paul & Duluth will order 300 box cars.

The Canadian Pacific will buy 25 furniture cars.

The Rio Grande & Eagle Pass is about to order 20 gondola cars.

The St. Charles Car Co. is at work on 100 cars for the Mexican National.

The Bloomsburg Car Co. is building two cars for the Iroquois Iron Works.

The St. Joseph & Grand Island is in the market for 200 box and 50 coal cars.

The Union Pacific, Denver & Gulf is having 36 cars built by the St. Charles Car Co.

The Central of New Jersey will probably let a contract for 500 box cars on June 17.

We are reliably informed that the Northern Pacific is about to issue specifications for 500 box cars of 70,000 lbs. capacity.

The Washington County has received bids for building the eight passenger cars referred to in our issue of Jan. 7, and the contract will probably be awarded late this or early next week.

Lucian Eaves, Secretary of the Northwest Railroad, 11 Broadway, New York City, will correspond with builders of ore cars, as a number will be needed for the Northwest and Idaho railroads (see Railroad Construction column).

The 500 cars ordered by the Grand Trunk from the Michigan-Peninsular Car Co., and mentioned in our issue of last week, are all of 60,000 lbs. capacity, and will be delivered in June and July. Two hundred and fifty will be box cars and 250 double deck stock cars.

The Minneapolis & St. Louis will, on June 10, order 200 box cars of 60,000 lbs. capacity for August 31 delivery. They will be 34 ft. long, weigh 34,000 lbs., and be equipped with Fox trucks on part and Diamond frame trucks with Simplex bolsters on the rest; Monarch brakebeams, Lappin brake shoes, Westinghouse brakes, Damascus brasses, Standard couplers, Dunham door fastenings, Butler draft rigging and McCord journal boxes and lids.

Plans have been prepared by E. M. Herr, S. M. P., Northern Pacific, for some steel coal cars of 100,000 lbs. capacity, and are now in the hands of the builders for bids. While we understand that nothing definite had been decided regarding orders for such cars up to the time of our going to press, it is probable that several hundred will be built for this road. They have been designed for service on the Western Divisions, and will be used to haul ore West and coal East.

The Chicago, Rock Island & Pacific has placed an order with the Michigan-Peninsular Car Co. for 500 new box cars, as noted in this column last week. These cars will be of 60,000 lbs. capacity, 34 ft. long, 8 ft. 6 in. wide, and weigh 28,500 lbs. They will be equipped with Bettendorf brake beams, Westinghouse air brakes, Janney couplers, Dunham doors and door fastenings, malleable iron journal boxes, Winslow-Murphy roofs, chilled cast iron wheels, and Chicago, Rock Island & Pacific draft rigging and rigid trucks.

BRIDGE BUILDING.

BUFFALO, N. Y.—Press reports state that plans are being prepared by the City Engineer for an iron bridge over Buffalo River at Seneca street.

CHICAGO, ILL.—Proposals will be received until July 20 for building superstructures for five bridges along the line of the Main Drainage Channel. The bridges are: Summit and Lyons, highway, crossing

main channel, swing; Chicago Terminal Transfer Railway, Desplains River, fixed span, 100 ft.; Willow Springs; Lamont and Remo, highway, swing bridges, over main channel.

CLEVELAND, O.—Press reports state that bids are wanted June 24 for a steel and iron bridge over the tracks of the Erie. George R. Warden, Board of Public Works.

DES MOINES, IA.—It is stated that the Commissioners of Polk County will build a bridge to cost about $10,000, over the Des Moines River at Polk, about 10 miles north of the city.

ELKTON, MD.—The Commissioners of Cecil County will receive bids July 5 for building four iron bridges to replace those recently destroyed by flood. John Bank, County Treasurer. (June 3, p. 397.)

GREENWOOD, MISS.—The Illinois Central will build a bridge over the Yalobusha River, between Carroll and Laflore Counties, on the Phillip branch extension of the Yazoo & Mississippi Valley. (See Railroad Construction Column.)

HARTFORD, CONN.—The Board of Street Commissioners and City Attorney McConville have petitioned the Railroad Commissioners to decide the plan of the new bridge to be built across the railroad tracks on Broad street. The Street Board has had two plans prepared, and the New York, New Haven & Hartford road has prepared one set, but the two parties have failed to agree.

LOS ANGELES, CAL.—It is stated that the Los Angeles Traction Co. will build a viaduct 1,600 ft. long over the Santa Fe River on the line of the extension contemplated to San Pedro.

MIDDLETOWN, O.—Sealed proposals will be received at the office of the Auditor of Butler County, at Hamilton, until June 14, for an iron viaduct and hoist bridge across the Miami and Erie Canal at Third St., Middletown. Frank X. Duerr, County Auditor.

MONTICELLO, MO.—Press reports state that bids are wanted June 27 for building four iron bridges. Geo. H. Roberts, Engineer, Lewis County.

OREGON, MO.—Holt County will build a steel bridge, 75-ft. span.

OSHKOSH, WIS.—Press reports state that the Chicago & Northwestern will build a double track, steel-truss draw bridge over the Fox River at Oshkosh.

OTTAWA, ONT.—Among the items in the Dominion supplementary estimates for the fiscal year ending June 30, 1898, are the following: Renewal of steel bridge at Dalhousie, $20,000; renewal of the swing bridge, Port Dalhousie, $8,300; renewal of the bridge over Welland Canal raceway, $3,000; new bridge at Dunnville, $39,000; repairs to the Sapper's bridge, Ottawa, $2,000.

SPOKANE, WASH.—Press reports state that a bridge will be built across the Spokane River, to carry the water mains, at a cost of about $9,000.

STOCKTON, MO.—Cedar County will build two iron bridges, 112 and 150 ft. long, respectively.

TUCKAHOE, N. J.—The joint committee of the Boards of Freeholders of Atlantic and Cape May Counties will meet at the Ebbitt House, Cape May City, at noon, June 14, to receive plans and specifications for a drawbridge, of about 117 ft. span, over the Tuckahoe River. J. C. R. Smith, Clerk Commissioners, Cape May. (June 3, p. 937.)

WEST UNION, O.—Bids are wanted June 15 for building three iron and steel bridges in Adams County.

YOUNGSTOWN, O.—Sealed proposals will be received by the Commissioners of Mahoning County until June 23 for building the superstructure of an iron bridge at South Ave. C. F. Brenner, County Auditor.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Boston & Lowell.—Four per cent., payable July 1.
Chicago & East. Ill.—Preferred, quarterly, 1½ per cent.; common, 2½ per cent.; payable July 1.
Chicago & Northwestern.—Common, 2½ per cent.; preferred, quarterly, 1¾ per cent.; payable July 6.
Chicago Junction and Union Stock Yards.—Preferred, quarterly, 1½ per cent.; common, semi-annual, 4 per cent.; payable July 1.
Chicago, Rock Isl. & Pac.—Quarterly, 1¼ per cent., payable Aug. 1.
Eastern (N. H.)—One and one-half per cent., payable June 15.
Little Miami.—Guaranteed, quarterly, 2 per cent., payable June 10.
Lowell & Andover.—Four per cent., payable June 6.
Portland & Rumford Falls.—Quarterly, 1 per cent., payable June 15.
St. Louis & San Francisco.—Preferred, 1st, 2 per cent.; 2d, 1 per cent.; payable July 6.
New York & Harlem.—Four per cent., payable July 1.

Buffalo Ry.—Quarterly, 1 per cent., payable June 15.
Chicago City.—Quarterly, 3 per cent., payable June 30.

Entertainments at Saratoga Conventions.

The Standing Committee of the supply men of the Master Car Builders' and Master Mechanics' Conventions has engaged the services of the famous Reeve's band of Providence. Among other attractions decided on are the Glee, Mandolin and Banjo clubs of Union College, Schenectady, and a well-known prestidigitator.

Engineer's Club of Cincinnati.

At the May meeting of the club, Mr. Schuyler Hazard read a paper on "Notes on American Railways." Many interesting and historical facts and data in reference to the early building of railroads in the United States had been collected by Mr. Hazard for his paper. The early forms of construction of track, structures, rolling stock, etc., were described and illustrated by numerous old cuts and drawings and some actual sections of old strap rails were exhibited. Quite an interesting feature of the paper was the reference to the pioneer engineers and others interested in the construction of our first railroads, to whom we are indebted for the vast transportation system of to-day. The question of joining the Association of Engineering Societies was again up and discussed at some length, but no conclusion reached.

St. Louis Railway Club.

At the regular meeting of the Club, held May 13, President Adams in the chair, Mr. W. M. Pratt, Manager Central Car Service Association, read a paper on "Demurrage versus Car Service Associations," an abstract of which was printed in the Railroad Gazette, June 3, page 389. Discussion was had on the topic, "What Benefit Does the Transportation Department Derive from Joint Car Inspection at Terminals?" The paper on "Car Inspection," by Mr. Charles Waughop, was before the Club at the April meeting, and an abstract printed in the Railroad Gazette May 6, page 324.

The Auditing Committee reported its examination of the Club's books, and it was shown that there was a balance on hand of $1,853.62.

Resolutions were adopted on the death of Mr. John Alpha Warner, a member of the Club.

Local Freight Agents' Association.

The National Association of Local Freight Agents' Associations will hold its annual convention at Cincinnati June 14, 15, 16 and 17. Business sessions are appointed for Tuesday, Wednesday and Thursday, while there are excursions and social sessions on all four days. Addresses are to be given by the Mayor and the President of the Chamber of Commerce; and by Mr. M. E. Ingalls, Mr. W. W. Peabody and Mr. S. R. Knott.

Among the topics to be discussed at the business sessions are: Uniform plan of showing on way bills the weight of carload freight and how it was arrived at; Graded minimum weights for bulky freight in large cars; Use and abuse of tracers; Abolishing Sunday work in freight houses; United States government bills of lading; Securing co-operation of banks in identifying bills of lading attached to drafts and making of way bills on typewriters. There will be a proposition to have topics prepared and sent to local associations sixty days before the annual meeting.

Engineer's Club of St. Louis.

The 474th meeting of the club was held, with Vice-President Colby in the chair. Thirty-seven members and four visitors were present. Prof. J. B. Johnson made a verbal report for the committee appointed to memorialize the Secretary of War and the Missouri Congressmen regarding the enlistment of a volunteer brigade of engineers. He stated that telegrams and memorials had been sent as directed and that favorable replies had been received from the Congressmen. It was reported that a regiment of engineers was to be raised in the Mississippi Valley. A vote of thanks was extended to the St. Louis Stamping Works, the St. Louis Terminal Railway Association and Mr. Norman W. Eayres for courtesies extended to the club on the occasion of its excursion to Granite City. The paper of the evening was "The Ethics of Engineering," by Mr. Charles Carroll Brown. A definition and a discussion of ethics were first given. The rise of the learned professions from the priests was traced. It was stated that the standard of ethics in business and professional life was lower at the present time than formerly, and the reasons for this were given. The paper closed with a plea for the necessity for a code of ethics in the engineering profession. In the discussion which followed, several of the members differed with the author of the paper as to the necessity of a code of ethics and contended that the standard of ethics in the engineering profession had always been a high one. The discussion was participated in by Messrs. Holman, Moore, Johnson, McMath, Crosby, Eranne, Ferguson, Flad and Laird.

Master Mechanics' Convention.

The American Railway Master Mechanics' Association will meet in its Thirty-first Annual Convention at 9 a. m. June 20, at Saratoga, New York. The order of business, under the item, "Reading of Papers and Discussion of Questions Propounded by Members," is fixed by the by-laws as the special order from 12 o'clock noon, until 1 p. m. of each day. The discussion of the subject, "Application of Electricity to Steam Railroads" was, by motion, made a part of the programme for 1898. The Committee on Subjects proposes the following subjects for topical discussion and recommends that the discussions be limited to ten minutes on each topic, no member to speak more than once until all who wish have spoken:

1. The special apprentice.
2. Is it possible to arrange the front ends of locomotives so they will clear themselves of cinders without throwing sparks?
3. The advisability of a systematic course in engineering in connection with technical schools.
4. The use of steel in locomotive construction.
5. To what extent and with what success have the recommendations of the Committee on Exhaust Nozzles and Steam Passages been adopted?
6. Has not the time arrived when air brake instructors can accomplish more by instructing those who maintain brakes how to maintain them, than to instruct those who use them how to use them?
7. The best arrangement of flanged and bald tires on ten-wheel locomotives to secure the least wear of tires and rails.
8. When double headers are used on passenger or freight trains, is it good practice to cut out the brakes on the head engine, and does this comply with the requirements of the law?
9. Is the use of fusible, or soft, plugs in the crown sheets of engines advisable?
10. What advantages are gained by the use of piston rods extended through the front cylinder head?
11. When extended piston rods are not used, which type of piston head is the cheapest, cylinder wear considered—the solid head, or one with bull ring and follower?
12. What can be done to thoroughly relieve the vacuum in a low pressure cylinder of compound locomotive when drifting?

Under the head of "Reports of Committees" will come the reports of the following committees:

1. Tonnage Rating for Locomotives.—G. R. Henderson, F. Hufsmith, T. B. Purves, Jr.
2. Advantage of Improved Tools for Railroad Shops.—T. W. Gentry, T. R. Browne, John Player.
3. Best Form of Fastening for Locomotive Cylinders.—J. E. Sague, R. P. C. Sanderson, T. L. Chapman.
4. Best Method of Boiler and Cylinder Insulation.—J. H. Manning, J. F. Deems, Wm. McIntosh.
5. Efficiency of High Steam Pressure for Locomotives.—Prof. W. F. M. Goss, Wm. Forsyth, Tracy Lyon.
6. Square Bolt Heads and Nuts; and Standards for Pipe Fittings (joint with Master Car Builders' Association).—E. M. Herr, C. H. Quereau, W. H. Marshall.
7. Air Brake and Signal Instructions (joint with Master Car Builders' Association).—G. W. Rhodes, A. M. Waitt, B. Haskell, C. H. Cory, A. W. Ball.
8. Standing Committee on Apprentice Boy.—W. F. Bradley, A. E. Manchester, W. H. Harrison, H. P. Robinson, G. R. Joughins.
9. Subjects.—C. H. Quereau, W. H. Thomas, P. Wallis.

Acting under the authorization of the Association in June, 1897, the Executive Committee has arranged for a lecture to be given on the evening of Tuesday, June 21, hour and place to be named at the convention.

Subject: "The Training of an Engineer." Illustrated by sixty stereopticon views. Prof. W. F. M. Goss, Purdue University.

Master Car Builders' Association.

The Master Car Builders' Association will meet in its thirty-second annual convention at Saratoga, New York, at 10 a. m. on Tuesday, June 15. The item in the order of business under "Reading and Discussing Questions Propounded by Members," is fixed by the constitution as the special order at 12 o'clock noon of each day. The subjects for topical discussion as prepared by the committee are as follows:

1. Lumber specifications for freight cars.
(a) Standard sizes for longitudinal sills for box, stock, long gondola and hopper gondola cars.
(b) Standard width of siding and roofing for box cars.
(c) The best substitute for white pine for freight car siding.
Discussion to be opened by P. Leeds.
2. The present master car builders' journal boxes, stop wedges, brasses and lids.
(a) It is claimed that the present shape of top of wedge is a source of danger by throwing center of load outside or inside of center of journal, thereby concentrating load on one end or the other, instead of distributing it equally.
(b) A consideration of the general form of box and the present lid, which has not been entirely successful as a dust-proof covering.
(c) Limiting thickness of journal bearings when worn out.
3. Limit gages for safe allowable wear in master car builders' coupler.
4. A consideration of the best arrangement of air-testing plant for large terminal points.
Discussion to be opened by H. F. Ball.
5. Standard truck for 60,000 lbs. capacity cars; standard truck for 80,000 lbs. capacity cars; standard truck for 100,000 lbs. capacity cars.
(a) To consider the advisability of the Master Car Builders' Association adopting standard trucks for cars of these capacities, or the possible adoption of standard parts, with a view to decreasing the number of varieties of parts now used.
(b) The relative efficiency of metal trucks of various forms as compared with each other and with the diamond truck, comprehending the cost of maintenance, the effect on wheels and journals, and as regards safety.
(c) The results obtained by the use of metal body bolsters.
(d) A design for the best and most economical truck bolster for diamond trucks, with a consideration of the best material for this purpose.
(e) Has the pressed steel truck demonstrated the fact that it is superior to the diamond truck and can be maintained more cheaply than the latter with arch bars 1¼ by 4 in. under 60,000 lbs. capacity cars?
Discussion to be opened by E. D. Bronner.
6. Side bearings.
A consideration of the increased resistance of cars, due to a large amount of the weight being carried on side bearings, and the best means for overcoming this difficulty.
7. Air brake details for freight cars.
A consideration of the advisability of securing uniformity in details of air brakes on all classes of cars, and the possibility of adopting standard forms for piping; also a consideration of better designs of piping, whereby all elbows would be omitted and bends of large radius substituted.
Discussion to be opened by A. L. Humphrey.
8. Axles.
(a) Design for axle for cars of 100,000 lbs. capacity.
(b) Revision of the design of axle for cars of 60,000 lbs. capacity.
Discussion to be opened by E. D. Nelson.
9. Owing to the fact that within a comparatively short time all of the freight cars in the country will be equipped with master car builders' couplers, should not the present limits for height of drawbars be modified?
Discussion to be opened by C. A. Schroyer.
10. The best form of support for coal car doors to overcome the difficulties in winter by coal freezing in cars.
11. The best method of securing running boards to car roofs, and the proper place for ladders on freight cars; on the side or on the end.
Discussion to be opened by A. E. Mitchell.
12. The durability of paint applied to freight cars by compressed air as compared with paint applied by the brush.
Discussion to be opened by F. W. Brazier.
13. To consider whether the master car builders' coupler as now applied gives all of the security necessary against trains breaking in two, or should some additional device be used?
Discussion to be opened by A. M. Waitt.
14. Does the use of malleable iron knuckles in the master car builders' couplers come in conflict with section 29 of rule 3?
15. The best practice for the proper maintenance of triple valves.
Discussion to be opened by G. W. Rhodes.

Under the head of "Reports of Committees" will come the reports of the following standing committees:

On Arbitration.—G. W. Rhodes, Chairman; John Mackenzie, M. M. Martin, G. L. Potter, J. N. Barr.
On Supervision of the Standards and Recommended Practice of the Association.—A. M. Waitt, Chairman; G. L. Potter, Wm. Apps.
On Triple Valve Tests.—G. W. Rhodes, Chairman; A. W. Gibbs, W. S. Morris.
On Standard Wheel and Track Gages (to confer with the American Railway Association).—J. N. Barr, Chairman; G. W. Rhodes, G. L. Potter, C. M. Mendenhall.
On Brake Shoe Tests.—S. P. Bush, Chairman; Geo. Gibbs, R. P. C. Sanderson.
On Prices in Master Car Builders' Rules (to report what changes are desirable).—J. N. Barr, Chairman; S. P. Bush, J. H. McConnell, S. A. Charpiot, T. B. Purves, Jr.
To Confer with Auditors.—J. S. Lentz, Chairman; Wm. Garstang, W. W. Atterbury.

The committees appointed to report at this convention are as follows:

1. Rust from Salt-Water Drippings.—Best method of preventing injury to track and trucks by salt-water dripping from refrigerator cars. S. Higgins, Chairman; A. M. Waitt, Thos. Kirby.
2. Trains Parting.—Extent and causes of breaking in two with automatic couplers, and the remedy. B. E. Thompson, Chairman; J. M. Holt, D. Hawksworth.
3. Square Bolt Heads and Nuts: Standard for Pipe Fittings (joint with Master Mechanics' Association).—C. A. Schroyer, Chairman; W. H. Lewis, Thos. Fildes.
4. Specifications for Air-Brake Hose.—A. M. Waitt.
5. Springs for Freight Car Trucks.—To suggest standard coils. J. S. Lentz, Chairman; A. G. Steinbrenner, F. W. Brazier, R. P. C. Sanderson.
6. Thermal Tests for Car Wheels.—Their value and how to conduct them. S. P. Bush.
7. Care of Journal Boxes.—Best method of packing. J. T. Chamberlain, Chairman; J. J. Hennessey, R. H. Johnson.
8. Air Brake and Signal Instructions (joint with Master Mechanics' Association).—E. W. Grieves, Chairman; Wm. Garstang, J. E. Simons, E. D. Bronner.
9. Steel Car Framing.—To review plans submitted by members in 1897, and to report designs for cars of different classes. A. E. Mitchell, Chairman; W. P. Appleyard, Wm. Forsyth.
10. Subjects for 1899.—E. D. Nelson, Chairman; Wm. McWood, A. L. Humphrey.

11. Passenger Car Pedestal and Journal Box for Journal 4¼ by 8 Inches.—G. W. West, Chairman; E. A. Benson, T. B. Purves, Jr., J. W. Marden, F. W. Chaffee.

PERSONAL.

—Prince Albert of Belgium, as the guest of Mr. George Westinghouse, visited several of the great works of the Pittsburgh District last week.

—Mr. George S. Morison, M. Am. Soc. C. E., has closed his Chicago office; his business address will hereafter be at his New York office, 35 Wall street.

—Captain David Du B. Gaillard, Corps of Engineers, U. S. Army, has been appointed by the President Colonel of the Third Regiment Volunteer Engineers.

—Mr. William McConway, President of the McConway & Torley Co., Pittsburgh, will sail this week with his family for a tour of England, Ireland and Scotland.

—Mr. David J. Jenkins, Chief Electrician of the Pennsylvania Steel Works, has been assigned as Assistant Engineer on the Amphitrite of Admiral Sampson's fleet.

—Mr. H. W. Decker, formerly Superintendent of the Air Brake Department of the Southern Pacific, died at his home in Sacramento, Cal., at midnight, May 29, at the age of 40.

—Mr. John F. Paukhurst, Vice-President and General Manager of the Globe Iron Works Co., Cleveland Ohio., died suddenly in that city June 2, of heart disease, at the age of 68.

—Mr. Gardner C. Sims of Providence, R. I., recently detailed for duty on board the repair ship Vulcan, now at the Charleston Navy Yard, has been appointed Acting Chief Engineer.

—Major William S. Stanton, Corps of Engineers, U. S. Army, has been ordered to Boston, Mass., to relieve Lieutenant-Colonel William R. Livermore, who goes to duty with the Volunteers.

—Lieutenant Eugene W. Van C. Lucas, M. Am. Soc. C. E., Corps of Engineers, U. S. Army, and stationed at Willets Point, N. Y., has been appointed Major in the United States Volunteer Engineer Corps.

—Mr. E. D. Boswell, President of the Temiscouata Railway, died June 3 at Riverre du Loup, Canada, after a short illness. He was formerly Cashier of the Montreal Branch of the Bank of Toronto. He was 50 years old.

—Mr. Eduardo Justo Chibas, Assoc. M. Am. Soc. C. E., M. Am. Inst. M. E., of New York City, has been appointed to the staff of Brigadier-General William Ludlow, M. Am. Soc. C. E., Chief of Engineers on the staff of the General commanding.

—Major Dan. C. Kingman, Corps of Engineers, U. S. Army, has been appointed to succeed Lieutenant-Colonel John Biddle, M. Am. Soc. C. E., Corps of Engineers, U. S. Army, who has been appointed Chief Engineer of the Corps of United States Engineer Volunteers.

—Captain J. Kuhn, Corps of Engineers, U. S. Army, has been appointed Division Engineer with the rank of Major in the United States Volunteer Engineers. First Lieutenant E. W. B. Lucas, Corps of Engineers, U. S. Army, has been appointed to the same rank as Captain Kuhn.

—Mr. James McNaughton, Superintendent of Motive Power of the Wisconsin Central for the past eight years, has resigned to become Superintendent of the Brooks Locomotive Works. The appointment of Mr. McNaughton's successor had not been announced up to the time of going to press.

—Mr. Stephen D. Caldwell, who for ten years previous to 1868 was Manager of the Erie Railroad Steamboat lines, with headquarters at Dunkirk, N. Y., died at Buffalo, May 26, at the age of 70. He was more recently Manager of the Western Transit Co., the lake line of the New York Central and Hudson River.

—Mr. R. F. Hoffman, who for more than a year past has been the mechanical editor of the "Railway and Engineering Review," has accepted a position in the mechanical department of the Atchison, Topeka & Santa Fe under Mr. John Player, Superintendent of Machinery. Mr. Hoffman, for the present, will be stationed at Topeka.

—Mr. A. G. Menocal, Civil Engineer, U. S. Navy, has been found guilty of inefficiency and neglect of duty in the construction of a dry dock in the New York Navy Yard, and has been sentenced to suspension of duty for three years on furlough pay. The members of the court martial united in a recommendation to the Secretary of the Navy for clemency.

—Captain Edward Burr, Corps of Engineers, U. S. Army, and recently in charge of the Washington Aqueduct at Washington, D. C., has been ordered to Fort Tampa, Fla., to relieve Lieutenant-Colonel James Lusk, Corps of Engineers, U. S. Army, who was recently appointed Chief Engineer of the Second Army Corps. Colonel Theodore A. Bingham, Corps of Engineers, U. S. Army, in addition to his duties in charge of public buildings and grounds in Washington, will relieve Captain Burr of the charge of the aqueduct works.

—Captain Willard Young, of Utah, formerly of the Engineer Corps, U. S. Army, has been appointed Colonel of the Second Regiment Volunteer Engineers. Captain Edward Burr (see other item) is Lieutenant-Colonel. The Majors appointed for this regiment are B. C. Savage of New York, Edward L. Pinckard of Alabama, and Captain William C. Langfitt, Corps of Engineers, U. S. Army. Other appointments in this regiment are: Captain, Second Lieutenant Robert J. Johnston, Corps of Engineers, U. S. A.; First Lieutenant, Charles W. Parker of Ohio; Second Lieutenant, Frank H. Martin of Iowa.

—Mr. Ramsen R. Cable, who has been elected as Chairman of the Board of Directors of the Chicago, Rock Island & Pacific, began his railroad service as Superintendent of the Peoria & Rock Island, which is now the Rock Island & Peoria. He was subsequently Assistant to the President, Vice-President and General Manager of the same road. In 1883 he became President of the Chicago, Rock Island & Pacific, doing double duties until September, 1887, when he dropped those of General Manager. From that date until being elected Chairman of the Board of Directors last week, he was President of the Chicago, Rock Island & Pacific, and also of the Rock Island & Peoria. (See Elections and Appointments column.)

—Mr. Charles W. MacCord, younger son of Professor C. W. MacCord, of Stevens Institute of Technology, died on Sunday last at Auburn, N. Y., from the result of an operation for appendicitis. Mr. MacCord was in his 26th year. Four years ago he graduated from the Stevens Institute, and soon became associate editor of Power. While there, he published a series of articles on valve gears, which last year was published in book form. Since last June he has held a responsible place with the firm of McIntosh, Seymour & Co., engine builders, of Auburn, N. Y. Mr. MacCord was a clear writer, and, although young, had gained favorable recognition among engineers. In all that he undertook, he displayed remarkable energy, which made him a natural leader among his associates.

—Captain George W. Geothals, Corps of Engineers, U. S. Army, has been appointed Lieutenant-Colonel of First Regiment United States Volunteer Engineers; and First Lieutenant John S. Sewell, Corps of Engineers, U. S. Army, has been appointed Major in the same regiment with Dr. Louis Duncan, Professor of Engineering in the Johns Hopkins University at Baltimore, Md., and J. D. Ferguson, of District of Columbia. The Captains appointed for the First Regiment are: William Barclay Parsons, of New York, Ira A. Shaler of New York, Eugene Ellicott of Pennsylvania, Edward B. Ives of New York, Allen D. Raymond of Pennsylvania, Merritt H. Smith of New York, Azel Ames of Massachusetts, Arthur Haviland of New York, Charles P. Kahler of Maryland, Charles Parker Breeze of Virginia, William G. Ramsay of New York. First Lieutenants: David L. Hough of New York, Edmund M. Sawtelle of the District of Columbia, George W. Bramwell of New York, Joseph A. Stenmetz of Pennsylvania, Henry C. Wilson of the District of Columbia, M. A. Viele of New York. Second Lieutenants: Heber R. Bishop, Jr., Lawrence Lewis Gillespie and George Perrine of New York and Walter Abbott and Henry F. Walker of Massachusetts.

—Mr. Charles E. Emery, Ph. D., died at his home in Brooklyn, N. Y., June 1, of heart disease. Mr. Emery was born in Aurora, N. Y., March 29, 1838. He was educated at the academy at Canandaigua, N. Y., and while yet very young began building models of steam engines and boilers and spent part of his time in the drawing room of a railroad office, subsequently learning the details of mechanical work in a country shop. He then studied law for two years and at the beginning of the war entered the United States Navy as Third Assistant Engineer, and in 1862 was made Second Assistant Engineer, where his suggestions for experiments with steam apparatus attracted the attention of the engineer in chief, who assigned him to experimental duty at the Novelty Iron Works, New York, where he remained until 1870, the last year of his stay there being devoted to experiments on stationary steam engines. During his connection with the navy, Dr. Emery supervised the building of several new vessels for the United States Coast Survey, and at this time was instrumental in interesting engineers in the adoption of the compound engine in this country. In 1869 he became Chief Engineer, and finally Manager of the New York Steam Co., designing and overseeing the building of the entire plant, which involved an outlay of over $2,000,000. Dr. Emery has been Consulting Engineer of the terminal facilities of the New York & Brooklyn Bridge and several principal plants of the Edison Electric Illuminating Co. He has lectured regularly before Cornell University during the last few years, and his popular lectures before the Engineering Department of the Brooklyn Institute of Arts and Sciences have always been well received. For many years he has been at the head of this department and has been the means of making it one of the very interesting sections of the Brooklyn Institute. Although during the last few years his attention has been directed more to the applications of electricity than to any other one subject, yet during this time he has been prominent among the different engineering societies and his work as Chairman of the Committee to report on standard methods for testing boilers has been of great service to engineers. He wrote a good deal on engineering subjects and took much part in the discussions in the many technical societies of which he was a member, being an energetic and active minded man and a man of great information. He was endowed with unusual gifts, physically and mentally, being a man of great stature and with a noble and impressive countenance. With these gifts, both physical and mental, and with his great intellectual energy, he was for years a very prominent figure among engineers. He was a member of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Society of Electrical Engineers, the Institution of Civil Engineers (British), and many other scientific and learned societies.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Dispatch.—W. C. Brown, formerly Traveling Freight Agent of the Pennsylvania, has been appointed New England Agent of the A. C. D. and the Richmond & Danville Dispatch, with office at 258 Washington street, Boston, Mass.

Atlantic Coast Line.—R. E. Smith has been promoted from Superintendent of Motive Power to General Superintendent of the system. Thomas H. Symington, heretofore Assistant Superintendent of the Richmond Locomotive & Machine Works, succeeds Mr. Smith as Superintendent of Motive Power, with office at Wilmington, N. C.

Bangor & Aroostook.—F. E. Rogers, Assistant Superintendent, with office at Brownville, Me., has resigned. W. H. Brown, Assistant Superintendent, with office at Bangor, has been appointed General Superintendent, and the offices of Assistant Superintendent have been abolished.

Bangor & Portland.—C. A. Ward, formerly Master Mechanic of the Kansas City, Osceola & Southern, is now Master Mechanic of the B. & P., with office at Bangor, Pa., succeeding George Holmes.

Brattleboro & Whitehall (Central Vermont).—At the annual meeting held in Brattleboro, Vt., May 30, Directors were elected as follows: C. F. Thompson, E. L. Waterman, Francis Goodhue, Brattleboro; O. L. Sherman, Williamsville; E. B. Batchelder, Townshend; J. T. Taft, West Townshend; J. Q. Shumway, Jamaica; J. W. Melendy, South Londonderry, and C. B. Williams, Winhall, Vt. At a meeting of the directors C. F. Thompson was elected President, E. L. Waterman Vice-President, C. H. Thompson Treasurer, F. Goodhue, and J. W. Melendy, Executive Committee, and F. Goodhue, Auditor.

Chesapeake & Ohio.—Assistant Freight Traffic Manager Frank M. Whitaker, has been appointed Freight Traffic Manager, succeeding the late W. P. Walker, Jr. Mr. Whitaker's office of Assistant Freight Traffic Manager in Cincinnati has been abolished. A. G. Troup, Assistant Freight Traffic Manager with headquarters in New York City, will continue in that position, reporting to Mr. Whitaker at Cincinnati. Mr. Whitaker was born in Clermont County, O., in 1866, and is believed to be the youngest Freight Traffic Manager in the United States. He was Manager of the Kanawha Despatch for about two years until Feb. 15, 1896, when he was appointed Assistant Freight Traffic Manager of the C. & O.

Harry Frazier, Chief Engineer, with office at Richmond, Va., has resigned. No successor has yet been named. Mr. Frazier was Superintendent of the Huntington & Cincinnati Divisions of the Chesapeake & Ohio from April 1, 1890, to July 1, 1891, on which date he was appointed Chief Engineer.

Chicago & Eastern Illinois.—At the annual meeting held in Chicago, June 1, R. P. Flower was elected a Director in place of the late Benjamin Brewster. Mr. Flower was also elected a member of the Executive Committee, succeeding O. S. Lyford.

Chicago & Northwestern.—At the annual meeting held in Chicago, June 2, M. L. Sykes, Vice-President, Secretary and Treasurer, expressed a desire to be relieved of the duties of treasurer; Samuel O. Howe, heretofore Assistant Treasurer, was elected treasurer in his stead. Mr. Howe is also Assistant Secretary, with office in New York. Richard H. Williams was elected Assistant Treasurer and Second Assistant Secretary and stationed at the New York office.

Chicago & Western Indiana.—At the annual meeting held in Chicago, June 7, W. F. Merrill was elected a Director, succeeding A. M. Tucker of Cleveland, O.

Chicago Great Western.—E. S. Hitchins, formerly Freight Auditor at St. Paul, Minn., has been appointed General Agent at Kansas City, Mo. He is succeeded by W. B. Martin.

Chicago, Rock Island & Pacific.—At the annual meeting, held in Chicago, June 1, President R. R. Cable was elected Chairman of the Board of Directors. First Vice-President Warren G. Purdy was elected President, to succeed Mr. Cable. Third Vice-President William H. Truesdale was elected First Vice-President; H. A. Parker, formerly assistant to the President, was elected Second Vice-President; J. F. Phillips, Treasurer, and George H. Crosby, Secretary. Mr. Phillips has heretofore been Assistant Secretary and Treasurer in Chicago. W. H. Truesdale was also elected a Director, filling the vacancy caused by the death of the late John de Koven. (May 6, p. 331.)

N. H. Burns, formerly Chief Clerk in the Freight Auditor's office, has been appointed Freight Auditor, succeeding George H. Crosby, promoted to Secretary. F. E. Hayne, heretofore Cashier, is appointed Assistant Treasurer and Secretary, succeeding J. F. Phillips, promoted.

Chicago, St. Paul, Minneapolis & Omaha (Chicago & Northwestern).—At the annual meeting held in Hudson, Wis., June 4, Richard H. Williams was elected Secretary and Second Assistant Treasurer.

Choctaw, Oklahoma & Gulf.—S. J. Haydon, formerly Auditor for the Receivers of the Louisville, Evansville & St. Louis, has been appointed Auditor of the C., O. & G., with office at McAlester, I. T., relieving J. F. Holden. Mr. Holden continues as General Manager, with headquarters at South McAlester.

Columbia & Puget Sound (Pacific Coast Co.).—Messrs. C. J. Smith, A. F. Burleigh, S. H. Piles, L. E. Smith and John T. Campion of Seattle, Wash., were elected Directors at the annual meeting held May 17 in Seattle.

Columbus, Sandusky & Hocking.—D. D. Byers has resigned as Traveling Auditor, his office being abolished. He had been connected with the Auditing Department for eight years.

Detroit & Lima Northern.—C. W. Taylor has been appointed Purchasing Agent, succeeding C. H. Roser, who was Chief Engineer and Purchasing Agent. His headquarters will be in Detroit, Mich.

Fitchburg.—Taking effect June 1, J. W. Marden, who is successor to John Medway, resigned as Superintendent of Motive Power (May 27, p. 382), will, with the title of Superintendent of Rolling Stock, have charge of the construction, maintenance and inspection of locomotives and cars, reporting to the President. The Chief Engineer will have charge of the construction and maintenance of passenger and freight depots and all other buildings heretofore under the supervision of the Superintendent of Car Department.

Great Northern.—W. B. Hutler of St. Paul, Minn., formerly clerk in the Passenger Department of the G. N., has been appointed Acting Northern Passenger Agent at Duluth, Minn., succeeding C. D. Harper, transferred. (May 27, p. 382.)

Idaho.—The officers of this company, referred to under the Northwest in the Construction column, are as follows: President, D. M. White, Lewiston, Idaho; Secretary, Carl Fowler, Buffalo, N. Y.; Treasurer and General Manager, Isaac E. Blake, 11 Broadway, New York. Carlos Gillispie is Chief Engineer, with office at Huntington, Ore.

Kansas City, Fort Scott & Memphis.—H. G. Wilson, heretofore Commercial Agent at Kansas City, has been appointed Assistant General Freight Agent,

with office in the same city, succeeding J. D. Riddell, made General Freight Agent. (May 13, p. 348.)

Kansas City, Pittsburg & Gulf.—Ira C. Hubbell, Purchasing Agent, informs us there is no truth in the rumors that he is about to sever his connection with the several companies comprising the "Port Arthur Route."

Los Angeles Terminal.—W. A. Cooper has been appointed General Agent of the Freight Department, in addition to his present duties as Chief Clerk. T. C. Peck has been appointed General Agent of the Passenger Department and Stationer.

Louisville, Henderson & St. Louis.—J. E. Cox has been appointed General Western Passenger Agent at St. Louis, Mo., succeeding Charles H. Jones.

Mobile & Ohio.—A. T. Barnett, who recently resigned as General Freight Agent of the New Orleans & Northeastern, has been appointed to the new position on the M. & O. of Contracting Freight Agent at New Orleans, La. (May 20, p. 366.)

New York Central & Hudson River.—In reorganizing the Passenger Department, General Passenger Agent George H. Daniels issued on May 31 a general circular showing the allotment of territory and duties to representatives of the Department. The following appointments among many others are effective from June 1:

M. C. Roach, General Eastern Passenger Agent, 413 Broadway, New York.—The City of New York and that portion of New England, which lies east of the Harlem Division, and south and east of the New England RR. to Hartford, Conn., and south of the Boston & Albany RR. from Springfield to Boston, Mass.; also the State of Pennsylvania east of the Susquehanna River, the States of New Jersey, Delaware, Virginia, the District of Columbia, and that portion of the entire southern territory lying east of and including Atlanta, Georgia.

W. B. Jerome, General Western Passenger Agent, 134 Monroe Street, Chicago, Ill.—The territory bounded on the east by the Detroit River and Lake Huron and the western line of Ohio, and a line drawn through Richmond, Indiana, and Chattanooga to the Gulf of Mexico; on the south by the Gulf of Mexico and the International Boundary; on the north by the Canadian Pacific RR.; on the west by a line drawn through Spokane, Wash., Boise City, Palisade and the Needles to the Gulf of California.

F. J. Wolfe, General Agent, Albany, N. Y.—Hudson Division from Yonkers north, including the Catskill Mountain region; the Putnam Division, the Harlem Division from White Plains north, and the territory north of the New England RR. and the New York, New Haven & Hartford as far as Springfield, Mass., the line of the Boston & Albany, and all the territory in New England north and east thereof. The Mohawk Division, to and including Syracuse and tributary territory, except the Adirondack Division and local business on the R., W. & O. Division.

G. C. Gridley, General Agent, Watertown, N. Y.—In charge of the local business of the R., W. & O. Division and the Carthage & Adirondack RR, reporting to the General Passenger Agent.

H. Parry, General Agent, 308 Main Street, Buffalo, N. Y.—Terrritory, the Western Division from Syracuse west, including the Auburn Division, and the territory tributary thereto; D., A. V. & P. Ry.; Western Pennsylvania, the State of Ohio and the Province of Ontario, as far East as Peterboro and Coburg, reporting to the General Passenger Agent.

The following appointments are announced on the Engineering Staff by W. J. Wilgus, recently appointed Engineer of Maintenance of Way: G. W. Bartlett, Division Engineer of the Eastern Division, headquarters at New York; J. C. Irwin, heretofore Superintendent of Bridges with office at Albany, N. Y., Division Engineer Middle Division, headquarters at Albany; E. F. Van Hoesen, formerly resident Engineer with headquarters at Rochester, N. Y., appointed Engineer of the Western Division with headquarters at Buffalo, N. Y.; C. J. Parker, Division Engineer of the R., W. & O. Division, with headquarters at Watertown, N. Y. W. D. Otis, General Roadmaster, and who had been in the employ of the N. Y. C. & H. R. for nearly 40 years, has resigned and the office has been abolished. Assistant General Roadmasters J. S. Caldwell, Buffalo, N. Y.; W. H. Van Wie, Albany, N. Y.; and A. S. Lippert, Buffalo, N. Y., have also resigned and the offices abolished. The office of General Master Builder is also abolished.

Mr. Wilgus announces that the organization of the Maintenance of Way Department given below is effective from June 1:

Each of the four divisions of maintenance of way will be in charge of a division engineer, as appointed above, who will report to the Engineer of Maintenance of Way.

(I.) Eastern Division, including the Hudson River, Harlem and New York & Putnam divisions. (II.) Middle Division, including the Mohawk Division, Mohawk & Malone Railroad and St. Lawrence & Adirondack Railroad. (III.) Western Division. (IV.) Rome, Watertown & Ogdensburg Division, including the R., W. & O. RR., C. & A. RR., and G. & O. RR. Each division engineer will be assisted by roadmasters in charge of track; a master builder in charge of water supply, buildings, platforms, docks and their appurtenances; a bridge inspector in charge of bridges, and an assistant engineer. The division engineers will freely consult and work in harmony with the superintendents on their respective divisions. The roadmaster's subdivisions will be rearranged where necessary by the engineer of maintenance of way.

Norfolk & Southern.—Herbert Roberts has been appointed Superintendent of Motive Power, succeeding G. R. Joughins, resigned. Mr. Roberts entered railroad service in 1861 with the London, Chatham & Dover Railway of England. He came to this country in 1867 in the service of the Grand Trunk Ry., and was successively Assistant Mechanical Superintendent and Mechanical Superintendent upon that road in charge of divisions west of the St. Clair River, having charge of locomotives, cars and ferries until July, 1897, since which time he has been engaged in business for himself. Appointment took effect June 1.

Norfolk & Western.—E. L. DuBarry, Superintendent of the Norfolk Division with headquarters at Crewe, Va., has been granted an indefinite leave of absence on account of sickness. J. C. Cassell, Division Superintendent at Roanoke, Va., has been appointed Acting Superintendent in his stead. E. W. Winters, Trainmaster of the Radford Division, succeeds Mr. Cassell.

Northern Central (P. RR.)—Daniel S. Newhall, the new Purchasing Agent of the Pennsylvania, was elected to the same office on the N. C. at the election held June 4 in Philadelphia. (June 3, p. 399.) Lewis Neilson was elected Assistant Secretary, to succeed Mr. Newhall.

Northwest.—The officers of this new company, referred to in the Construction column, are: President, Isaac E. Blake; Vice-President, Charles W. Haight; Secretary, Lucian Eaves, all of 11 Broadway, New York City; Treasurer, John H. Aitken, Huntington, Ore.; Chief Engineer, Carlos Gillispie, Huntington.

Ogdensburg & Lake Champlain.—E. M. Harter, Toledo, O., has been appointed Auditor. Edward P. Cutter was former Auditor, with office at Ogdensburg, N. Y.

Panama.—Percy Webb has been appointed Master Mechanic, with office in Colon, Colombia. The office had been vacant since the death of D. G. Mott several months ago.

Pennsylvania.—John Biggs, of Wilmington, has been appointed Solicitor for Delaware, to succeed the late Chancellor James L. Wolcott. Mr. Biggs is a son of the late Governor Benjamin T. Biggs, and was Attorney General of Delaware four years.

Pennsylvania Co.—At the annual meeting held in Pittsburgh, June 7, Effingham B. Morris was elected a Director, succeeding the late John E. Davidson.

Secretary John C. Sims has also been made Superintendent of the Employees' Savings Fund, in place of D. S. Newhall, promoted to Purchasing Agent.

Philadelphia & Reading.—At the annual meeting held in Philadelphia, June 7, Samuel Dickson was elected a Director, succeeding Francis L. Stetson of New York.

Robert S. Baymore has resigned as Press and Advertising Agent, to engage in mercantile business, and is succeeded by George C. M. Large. Mr. Baymore has been with the Passenger Department for nearly 15 years. His resignation took effect June 1.

Samuel Symonds, formerly Master Mechanic of the Fitchburg, has been appointed Foreman of Engines on the Philadelphia & Reading.

Philadelphia, Wilmington & Baltimore (P. RR.)—At the annual meeting in Philadelphia, June 4, Daniel S. Newhall was elected Purchasing Agent, and Lewis Neilson, Assistant Secretary, succeeding Mr. Newhall. (See Northern Central.)

Port Townsend Southern (Pacific Coast Co.).—At the annual meeting, in Seattle, May 17, the same directors were elected as on the Seattle & Northern. The election of officers has not been held yet.

Red River Valley.—At a recent meeting of the Directors held at Mt. Sterling, Ky., officers of this newly incorporated road (May 27, p. 383) were elected as follows: J. W. McCausey, Union City, Mich., President; A. L. French, Ft. Wayne, Mich., Vice-President; W. O. Hogart, Jr., Grand Rapids, Mich., Treasurer; James Muir of Grand Rapids, General Manager, and Tyler & Apperson, Mt. Sterling, General Counsel.

St. Louis, Peoria & Northern.—Alexander Rumpler, formerly Assistant to Geo. W. Stevens, Superintendent of Motive Power of the Lake Shore & Michigan Southern, has been appointed Assistant to the President of the St. L., P. & N., with office at St. Louis, Mo.

St. Louis Southwestern.—W. Couthlin, heretofore Superintendent of the Arkansas Division, with office at Pine Bluff, Ark., has been appointed Assistant General Superintendent, with headquarters at Tyler, Tex. S. W. Kennard is appointed Division Superintendent, succeeding Mr. Couthlin.

St. Paul, Eastern Grand Trunk (Chicago & Northwestern).—At the annual meeting, held in Milwaukee, Wis., June 3, H. R. McCullough was elected a Director, succeeding Horace G. Burt, resigned to become President of the Union Pacific.

Seattle & Northern (Pacific Coast Co.).—At the annual meeting, in Seattle, Wash., May 17, the following directors were elected: C. J. Smith, S. H. Piles, John T. Campion, A. F. Burleigh and L. E. Smith of Seattle, and John W. Simpson and John I. Waterbury of New York.

Texas Transport & Terminal Co.—James Graham, Jr., formerly Manager of the North American Transport Co. at Norfolk, Va., has been appointed Local Manager of the T. T. & T. Co. in Galveston, Tex. Reference is made of this company in the "Scrap Heap." Mr. Graham is now located in New Orleans, but will go to Galveston on July 1.

Union Pacific.—Elmer H. Wood, heretofore Assistant General Freight Agent, stationed at Omaha, Neb., has been appointed General Freight Agent, with office at the same place. C. J. Lane, also heretofore Assistant General Freight Agent, has been appointed First Assistant General Freight Agent, and William H. Garrett, Assistant Freight Agent. Appointments effective June 1.

United New Jersey R. R. & Canal Co. (P. RR.).—The following are the Directors as elected at the annual meeting held in Trenton, N. J.: John C. Barron, F. Wolcott Jackson, William W. Astor, Thomas Oakes, A. Van Santvoord, John Lowber Welsh, Samuel S. Dennis, J. Bayard Henry, Joseph D. Bedle, Henry W. Green, Henry P. McKean and M. Taylor Pyne. Mr. Pyne succeeds the late Gen. Robert F. Stockton. Henry P. McKean takes the place made vacant by the death of his father, Thomas McKean, and Henry W. Green succeeds his father, the late Charles E. Green.

Washington County.—William Barclay Parsons, Consulting Engineer of New York, has been appointed Chief Engineer. Mr. Parsons has also been appointed a Captain in the First Regiment, Volunteer Engineers. (See Personal column.)

Wisconsin Central.—James McNaughton, Superintendent of Motive Power and Cars of the Wisconsin Central Lines, will leave that position on the appointment of a successor, to accept the Superintendency of the Brooks Locomotive Works.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

ALASKA ROADS.—A company has been incorporated in the State of Washington, with a capital stock of $3,000,000 to build about 100 miles of railroad in Alaska to connect an ocean port probably on Norton Sound above Ft. St. Michael with the Yukon River about 700 miles above its mouth. The money is to be furnished by French and Dutch capitalists. E. A. Gardner, who has been in Africa building lines for the same syndicate, is General Manager of the Alaska company with headquarters at Seattle, Wash. A party of engineers and mechanics left San Francisco May 20 to make surveys for this line. (May 27, p. 382).

ARKANSAS, LOUISIANA & SOUTHERN.—This company, which was recently incorporated as successor to the Minden (May 13, p. 349), which runs from Sibley, La., a point on the Vicksburg, Shreveport & Pacific, north 20.25 miles to Minden, is building an extension of 20 miles northwest from Minden to a connection with the Louisiana & Arkansas, which is being extended south from Stamps, Ark. (Official.)

ATCHISON, TOPEKA & SANTA FE.—This company has a large force of men engaged in replacing old rails on the Atlantic & Pacific with new 56-lb. steel. Seventy-one miles between Barstow, Tex., and Mojave is finished. About 100 miles more will be laid in the fall. The old rails in the yards at Las Vegas, N. M., are being replaced by 80-lb. steel, and additional tracks are being put in. The reduction of the grade between Ft. Worth and Cleburne, Tex., is completed, and the road ready for service. The grade on 27 miles of trackage has been reduced from 70 ft. per mile to 47 ft. B. Lautry Sons, of Kansas, the contractors for this work, have another contract to reduce the grade between Cleburne and Temple, Tex., 99 miles.

BOSTON & MAINE.—Permission has been granted by the Maine Railroad Commissioners to lay track along Commercial street in Portland, Me.

BUFORD & LAWRENCEVILLE.—This company has been incorporated in Georgia, with a capital stock of $30,000 to build a line through the County of Gwinnett from Buford, a point on the Southern, south 15 miles to Lawrenceville, on the Seaboard Air Line. The incorporators are: H. L. Shadburn, Bona Allen, L. P. Pattillo, E. W. Vance, J. P. Neese, R. H. Allen, T. C. Burton, W. B. Shadburn, George L. Brogdon and C. L. Allen.

BURLINGTON, CEDAR RAPIDS & NORTHERN.—(See reference to Jasper Milling Co. under Great Northern.)

CANADIAN PACIFIC.—Foley Bros. of St. Paul, Minn., have secured the contract for 105 miles of line from Robson, B. C., west to Midway. This is to form an extension of the Crows' Nest Pass road, and is said to require an expenditure of $3,000,000. (May 27, p. 382.) Tracklaying on the Crows' Nest Pass will reach the Kootenay River early in January. Rails are being laid at the rate of three miles a day.

CAROLINA & NORTHWESTERN.—Grading is reported completed on the extension of this line from Hickory, N. C., to Newton, 10 miles, and rails are to be laid at once. J. R. Irvine & Co., of Morgantown, N. C., have the contract. This new line is to complete a gap between these points. The trains now run over the tracks of the Western North Carolina Division of the Southern. (Jan. 28, p. 70.)

CENTRAL VERMONT.—During this year new rails are to be put in over the entire Brattleboro & Whitehall line, which is operated by the Central Vermont, and the work of replacing the wooden bridges with iron ones begun.

CHESAPEAKE & OHIO.—Surveys are under way for the proposed switches to the manufacturing district in Covington, Ky.

CHICAGO, MILWAUKEE & ST. PAUL.—This company is doing a considerable amount of improvement work in St. Paul, Minn., and is building about 10 miles of masonry on the River Division. It is reported that 85-lb. rails are to be substituted for those in present use.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—The company is connecting its side tracks on the 110.8 miles between Indianapolis and Cincinnati to enable it to establish a positive block system. The connected sidings will eventually make a second track. Eighty-pound rail is also to be put in on this work. The rail is being distributed.

COAST RAILWAY OF NOVA SCOTIA.—J. H. Townsend & Co., of East Pubnico, N. S., have the contract for 66 miles of this line from East Pubnico to Lockeport and 20 miles is building. Two parties are in the field surveying from Lockeport to Halifax, 110 miles. (Official.) L. H. Wheaton of Yarmouth, N. S., is Chief Engineer. (Apr. 22, p. 300.)

DETROIT & LIMA NORTHERN.—Work has been resumed on the Columbus Northwestern line from St. Johns, O., southeast to Bellefontaine. Track-laying is to begin at once. (May 20, p. 367.)

GRANT CITY & SOUTHERN.—This company was incorporated in Missouri June 4 with a capital stock of $500,000 to build a line from Grant City in Worth County south about 20 miles to a point about 2 miles west from Albany in Gentry County, connecting two branches of the Chicago, Burlington & Quincy. Among the incorporators are: O. M. Spencer, S. E. Crance and C. M. Carter. This is the same line about which entry was made May 6 (page 332) under the C., B. & Q.

GREAT NORTHERN.—The Minnesota Railroad Commission has decided that the Burlington, Cedar Rapids & Northern and the Willmar & Sioux Falls, which is a part of the G. N., ought to build a connecting track at Jasper, Minn., as petitioned for by the Jasper Milling Co. of that place. The matter will be taken to the courts by the railroads.

ILLINOIS CENTRAL.—An extension of the Phillip Branch from Clarksdale, Miss., on the Yazoo & Mississippi Valley line, to run southeast 16½ miles to

Greenwood, is reported to be building by the Illinois Central. Work was begun last month.

KANSAS CITY, PITTSBURGH & GULF.—Track is laid into Fort Smith, Ark., on the Fort Smith Branch from Oak Lodge, on the main line, northeast 16 miles to Fort Smith. (May 6, p. 332.)

LEHIGH VALLEY.—Ballasting is in progress on the Seneca County extension from Geneva Junction, N. Y., east 8 miles to Seneca Falls, and it is expected that trains will be running by June 15. (April 8, p. 266.)

MARSHALL, TIMPSON & SABINE PASS.—Twelve miles from Russellville, Tex., north to Carthage is under contract to Avery & Co., of Timpson, Tex., on this proposed line from Timpson on the Houston & West Texas, north 20 miles to Carthage on the Texas, Sabine Valley & Northwestern. The track from Timpson to Russellville, 8 miles, was laid in 1896. T. S. Garrison of Timpson is General Manager.

MISSOURI PACIFIC.—The St. Louis Iron Mountain & Southern is contemplating a branch track from the main line in St. Louis, to run through certain streets of that city.

MUSQUODOBOIT.—Surveys are in progress for this Nova Scotia line from Windsor Junction, a point on the Intercolonial, to run east 40 miles through the Musquodoboit Valley to Parker's Corners, with power to extend the line to Halifax or Dartmouth. The Nova Scotia Assembly recently gave a charter. William Chisholm of Halifax is among those interested. (March 18, p. 208.)

NEW ENGLAND.—Press reports from New Haven, Conn., state that the Norwich & Worcester extension from Allyn's Point south six miles, instead of going to Groton and across the Thames Bridge to New London, will stop at the Navy Yard about one and a half miles above the bridge, and a ferry will be established from that point to New London. Work was begun on the extension Mar. 24. (Apr. 1, p. 246.)

NORFOLK & WESTERN.—Six miles of second track has been completed from Tulip to Bluefield, W. Va., on the Virginia & Ohio line, 85-lb. rail being used. (Jan. 14, p. 34.)

NORTHERN PACIFIC.—Grading is reported nearly finished on the extension of the Spokane & Palouse Branch from Pullman, Idaho, to Lewiston, 20.6 miles. Geiger & Zabriskie, of Tacoma, Wash., have the contract. Eleven miles of track have been laid. (Mar. 18, p. 208.)

NORTHWEST.—This broad-gage road, which was incorporated in Oregon about four months ago, is to run from Nagle, Ore., at the junction of the Oregon Short Line and the Oregon Railroad & Navigation Company's lines, north down the valley of the Snake River, 55 miles, to Oxbow and Ballard's Landing in the Seven Devils' mining district. The first eight miles from Nagle to Grey's Landing is to be built at once, and grading is now in progress. The rails, 58 lbs. in weight, are bought, and the company expects to have the track laid within 60 days. Work will be begun soon at the other end of the line from Oxbow, 22 miles up the river, to Wild Horse Creek. Meanwhile the company has a 70-ton steamer plying on the river, which carries ore from Oxbow to Grey's Landing, and this steamer will continue in operation until the entire road is completed. From Ballard's Landing northeast 19 miles, via Cuprum, to the Seven Devils' Copper Co.'s mines there is to be run a narrow-gage railroad called the Idaho RR. This line was partially graded about eight years ago, and the grading was practically completed last year. It is expected that rails will be laid within 90 days. Meanwhile the grade is being used as a wagon road for hauling ore. At either end of this line will be built two bucket tramways for handling ore. The Idaho RR. has a capital stock of $340,000, and bonds of $170,000, of which $95,000 are sold. A sinking fund for the payment of these bonds is created by the Seven Devils' Copper Co. The Northwest RR. has a capital stock of $1,850,000, and is to be bonded at $15,000 per mile. A large quantity of these bonds are sold. They are to be met by a sinking fund, created by a deposit from gross earnings of the road, of a sum annually sufficient to redeem $42,000 each year of the bonds. The Seven Devils' Copper Co. and the Smelting Co., operating in conjunction, have entered into contracts for the shipment of a large quantity of ore daily over the Northwest Railway. These contracts furnishing a guaranteed fund sufficient to pay the interest on the bonds, the sinking fund and operating expenses and 5 p. c. on the common stock. It is expected that the entire mileage will be built before the close of the year. The officers of both companies are given under Elections and Appointments.

PENNSYLVANIA CO.—Rails 85 lbs. in weight are being distributed along the Indianapolis Division of the Pittsburgh, Cincinnati, Chicago & St. Louis on the 41 miles of road between Bradford Junction and New Paris and Richmond, Ind., to replace those of lighter weight. Additional sidings are being placed at Washington, O., on the 31 miles of branch from Pittsburgh.

RICHMOND, PETERSBURG & CAROLINA.—The City Council of Petersburg, Va., has granted an extension of 90 days from June 10 for the completion of the first 20 miles from Petersburg of this line, which is projected to run from Ridgeway north 106 miles to Richmond, Va. The section is graded and much of the track laid. Gen. James S. Negley, 136 Liberty St., New York, is Vice-President and General Manager. (Nov. 19, 1898, p. 825.)

ST. FRANCOIS VALLEY.—This company has been incorporated in Missouri with a capital stock of $100,000 to build a line from Campbell, on the St. Louis Southwestern, to extend 10 miles in Dunklin County. Among the incorporators are Louis P. Houck, Leon Doyle and R. B. Andrews.

ST. LOUIS, PERRY & CHICAGO.—Surveys are made from Pearl, Ill., to Macomb, about 85 miles, and right of way is secured for about 75 miles. Moulton & Keene of 102 North Fourth Street, St. Louis, Mo., have the contract for the entire line from Grafton, Ill., to Macomb, 150 miles. (Official.)

SEIVERN & KNOXVILLE.—The last rail has been laid into Batesburg, S. C., completing this line from Greenwood to Batesburg. The Seivern & Knoxville is successor to the Greenwood, Anderson & Western, and operates under lease the Carolina Midland from Seivern south to Allendale, 55 miles. (May 6, p. 332.)

SOUTHERN PACIFIC.—The extension of the St. Martinsville Branch in Louisiana, from St. Martinsville northwest 23.3 miles, to Arnaudville, is reported completed. (May 6, p. 332.)

Electric Railroad Construction.

ALBANY, N. Y.—At a recent meeting of the promoters of the Albany, Helderberg & Schoharie Electric Ry. Co., H. W. Burgett, of Boston, was elected President, in place of John W. Van Valkenburg, and Mr. Charles L. Bibber, of Boston, Treasurer. The following new Directors were elected: W. H. Burgett, in place of F. C. Huyck; Richard Schemerhorn, Brooklyn, to succeed Jacob Kelch; Charles E. Bibber, Boston, to succeed John Loucks; Herbert Smith, Boston, in place of John W. Van Valkenburg; Charles Perkins, Boston, in place of Harrison Finkle. The Directors, members of the old Board, who still are in office, are: Benjamin M. Secor, of Albany; Thomas Wood, of Berne; C. G. Kromer, of Schoharie; J. M. Borthwick, R. J. McAuley, of Albany, and Mr. Twitchell, of Schoharie. Mr. Schemerhorn was made Chief Engineer. A contract for building the road was given to the Albany Construction Co. (May 27, p. 383.)

CHICAGO, ILL.—A mortgage covering $1,000,000 40-year 5 p. c. bonds, given by the Cicero & Harlem St. Ry. Co. to the Equitable Trust Co., has been filed for record. It covers the property of the company, which connects with the Lake Street Elevated road and runs through the township of Cicero. Under the resolution passed by the stockholders authorizing the issue of the bonds the company is also permitted to issue additional bonds to the extent of 75 p. c. of the cost of any permanent improvements or extensions that may be made. (Feb. 4, Feb. 25, April 22, pp. 89, 149, 301.)

It is again reported that the South Side Elevated line will be extended to Englewood as soon as the route can be decided upon, and that the question of a branch from the main line at Fortieth street, to take in the Stock Yards district, or a branch at Fifty-eighth street, is under consideration by the Directors. It will be remembered that an Englewood branch has been contemplated ever since the road was completed, in 1893.

Dickinson MacAllister, receiver of the Metropolitan West Side Elevated R. R. Co., petitioned Judge Showalter, in the United States Circuit Court, to allow him to expend $146,210 in building an addition to the present power house and in enlarging the electrical power plant. The petition was granted, and, if the present plans are carried out, the plant will be nearly doubled.

The Union Transit Co., Stock Exchange Building, gave notice that it would apply to the City Council June 6 for franchises on a large number of streets, in all about 20 miles, on the South Side. George Pfleger is Secretary of the company. The Union Transit Co. is the successor to the Great Lakes Transit Co., which was incorporated with a capital stock of $6,000,000 Aug. 7, 1883. The incorporators were Emanuel P. Barnett, Albert K. Norton and Frank E. Hayner, all Chicago lawyers. In April of last year the name of the company was changed to that of the Union Transit Co., and the by-laws changed so that its purposes were increased from owning vessels on the lakes to operating street car lines. Frank T. Winslow was president of the company and Leonidas Connell secretary last year. Lucius Clark, late of the General Electric Co., has now secured control of this charter. George Pfleger, secretary, is attorney of the company.

The Desplaines Valley Electric Ry. Co. is reported incorporated to build a road from Lyons to Chicago. The capital stock is $100,000. The incorporators are Henry B. Fargo of Geneva, Samuel S. Graham, Jr., of Oak Park, Nelson F. Merrall, Hiram A. Johnson and H. W. Percell of Chicago.

DAYTON, O.—The Dayton, Springfield & Urbana Transit Co. has elected the following officers: Frederick Colburn, Louisville, Ky., President; J. S. Harshman, Enon, O., Vice-President; J. S. Webb, Springfield, O., Secretary; A. E. Appleyard, Boston, Mass., Treasurer. This company was organized early in 1897 to build an electric railroad between the cities shown in the title, and, we understand, franchises have not been secured.

FAYETTEVILLE, W. VA.—The Fayette County Electric Railway Co. was incorporated May 25, with a capital of $30,000, to operate an electric railroad from Fayette Station to Fayetteville. The incorporators are: L. G. Gains, A. W. Hamilton, Morris Harvey, A. D. Preston and J. F. White, all of Fayetteville.

LITTLE FALLS, N. Y.—The Little Falls & Herkimer St. Ry. Co. has filed a certificate of its proposed route with the County Clerk, and work will be begun at once. This road will be on the north side of the Mohawk River, and connections will be made at Herkimer with the Herkimer, Mohawk, Ilion & Frankfort Electric RR. John V. Quackenbaush is president. (Sept. 3, Sept. 24, Oct. 1, '97; pp. 627, 681, 697.)

NEWPORT NEWS, VA.—The Newport News, Hampton & Old Point Ry. is contracting for material for the road, and it is expected to be in operation by Sept. 1.

OMAHA, NEB.—It is stated that the Omaha St. Ry. Co. is enlarging the capacity of its power plant to meet the heavy traffic expected at the coming exhibition. Six new boilers, new engines and generators are being installed. (May 6, p. 333.)

PADUCAH, KY.—The Paducah Ry. & Light Co. has filed articles of incorporation in Louisville. Capital stock is $200,000. Among the incorporators are: T. J. Flourney, George C. Thompson, W. F. Paxton, S. B. Caldwell and George C. Wallace. Mr. Flourney is secretary of the Paducah Street Ry. Co.

PEEKSKILL, N. Y.—The Peekskill Traction Co. has been given a franchise by the city of Peekskill, and work will begin shortly on the road to Cortland and Yorktown. (April 22, p. 301.)

PYMOUTH, MASS.—The Plymouth & Sandwich St. Ry. Co. has been organized, it is reported, and work will be begun on the road as far as Manomet Point at an early date. Among those given in early reports as interested in this road were Wm. H. Brine, Horace B. Taylor and Wm. B. Arnold. The road, if completed to Sandwich, will be about 20 miles long. (Nov. 26, '97, p. 841.)

PROVIDENCE, R. I.—The Union R. R. Co. will build an extension on Francis and Smith streets.

QUEBEC, QUE.—The consolidation of the Quebec, Montgomery & Charlevoix Ry. and the Quebec District Ry. is expected to take effect on or about June 30, after which work will be begun upon applying electricity as the motive power of the former road. The extension of the Quebec District Company's tracks to Victoria Park and the new exhibition grounds is also to be proceeded with. The new company will have a capital stock of $3,000,000, of which $2,000,000, it is stated, is subscribed.

SYRACUSE, N. Y.—The Syracuse Rapid Transit Ry. Co. has effected a lease for 50 years of the franchises and property of the Eastwood & East Syracuse R. R. Co., recently incorporated. (March 18, p. 209.) The Eastwood & East Syracuse Co. will commence to build the road as soon as the Railroad Commissioners can pass on the plans. The Rapid Transit Co. will make several extensions within the city limits on Seymour, North West and South Salina streets. The Burnett Ave. line will be extended to meet the proposed Eastwood & East Syracuse.

WHEELING, W. VA.—The Wheeling Ry. Co. is placing in its power station one Westinghouse 800 KW. generator, and a Cooper-Corliss direct connected engine with cylinders 34x60. Application has been made to the City Council for an extension of about one mile to the W. Va. State Fair Association grounds. If this ordinance is granted, the extension will be in operation about Sept. 1. The new power house machinery will be in position by July 10.

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

April 30:		1898.	1897.	Inc. or Dec.
Baltimore & Ohio Southwestern.				
1 month	Gross	$591,492	$491,274	I. $100,218
1 "	Net	151,627	126,477	I. 25,150
10 months	Gross	5,723,209	5,108,090	I. 615,119
10 "	Net	1,733,668	1,538,818	I. 194,850
Central of New Jersey.				
1 month	Gross	$113,019	$116,919	D. $3,900
1 "	Net	27,344	38,889	D. 11,545
4 months	Gross	506,509	457,432	I. 49,077
4 "	Net	129,536	139,735	D. 10,199
Denver & Rio Grande.				
1 month	Gross	$647,787	$552,946	I. $94,841
1 "	Net	264,219	252,473	I. 11,746
10 months	Gross	6,972,955	5,770,249	I. 1,202,706
10 "	Net	2,777,098	2,358,298	I. 418,800
Louisville & Nashville.				
1 month	Gross	$1,773,966	$1,569,408	I. $204,558
1 "	Net	479,750	424,826	I. 54,924
10 months	Gross	18,264,643	17,027,621	I. 1,237,022
10 "	Net	6,030,539	5,495,054	I. 535,485
Mexican Central.*				
1 month	Gross	$1,143,752	$1,179,179	D. $26,427
1 "	Net	400,027	422,710	D. 22,683
4 months	Gross	4,469,381	4,396,568	I. 72,813
4 "	Net	1,312,447	1,534,133	D. 221,686
*Mexican currency.				
Mexican National.*				
1 month	Gross	$490,728	$514,434	D. $13,706
1 "	Net	210,053	234,823	D. 24,770
12 months	Gross	2,023,271	2,013,164	I. 10,107
12 "	Net	916,888	967,047	D. 50,159
*Mexican currency.				
New York, Ontario & Western.				
1 month	Gross	$285,380	$300,190	D. $14,810
1 "	Net	62,105	76,832	D. 14,727
10 months	Gross	3,323,182	3,245,724	I. 77,458
10 "	Net	980,380	957,066	I. 23,324
Norfolk & Western.				
1 month	Gross	$950,320	$799,949	I. $150,371
1 "	Net	236,740	196,625	I. 40,115
10 months	Gross	9,492,362	8,797,651	I. 694,711
10 "	Net	2,946,367	2,222,997	I. 723,370
Northern Pacific.				
1 month	Gross	$1,850,818	$1,275,627	I. $575,191
1 "	Net	796,245	370,019	I. 426,226
Oregon Short Line.				
1 month	Gross	$514,297	$438,396	I. $75,901
1 "	Net	257,173	221,762	I. 35,411
10 months	Gross	5,161,443	4,645,926	I. 515,517
10 "	Net	2,134,807	1,667,240	I. 467,567
Philadelphia, Wilmington & Baltimore.				
1 month	Gross	.....	.....	I. $64,100
1 "	Net	.....	.....	I. 16,400
6 months	Gross	.....	.....	I. 309,800
6 "	Net	.....	.....	I. 60,200
Rio Grande Western.				
1 month	Gross	$274,456	$199,678	I. $74,778
1 "	Net	120,652	78,348	I. 42,309
10 months	Gross	2,769,481	2,011,729	I. 757,752
10 "	Net	1,058,678	667,176	I. 391,502
Southern Pacific.				
1 month	Gross	$4,695,462	$3,808,311	I. $887,151
1 "	Net	1,589,811	1,192,601	I. 397,210
10 months	Gross	46,486,545	41,295,316	I. 5,191,229
10 "	Net	18,212,787	14,884,931	I. 3,327,856
Union Pacific, Denver & Gulf.				
1 month	Gross	$292,086	$265,736	I. $26,350
1 "	Net	76,614	64,598	I. 12,016
Western New York & Pennsylvania.				
1 month	Gross	$249,595	$218,605	I. $30,990
1 "	Net	56,969	61,406	D. 4,437
10 months	Gross	2,763,328	2,503,938	I. 259,390
10 "	Net	970,814	806,132	I. 165,682

May 31:		1898.	1897.	Inc. or Dec.
Chicago & Northwestern.				
12 months	Gross	$35,992,726	$30,980,255	I. $5,012,471
12 "	Net	13,448,958	12,097,444	I. 1,351,511

ATCHISON, TOPEKA & SANTA FE.—Persistent rumors have been in circulation this week that the Atchison has acquired a controlling interest in the Indiana, Illinois & Iowa. Officials of the Atchison deny that any such deal has been even considered by the Board.

BALTIMORE & OHIO.—The executors of the will of Martha E. Gray filed a petition at Baltimore, Md., June 3, asking for a receiver for the Washington Branch of the B. & O. Judge Morris signed an order for the company to show cause by July 15 why a receiver should not be appointed. The Wash-

ington branch is a double-track line extending from Relay House, 9 miles west of Baltimore, to Washington, D. C., 31 miles. It was opened in 1835. Of the 16,500 shares of stock 10,280 are owned by the B. & O., 5,500 by the State of Maryland and 720 by other corporations and persons. The petitioners control 76 shares of the stock. No dividends have been paid since 1896, when the B. & O. went into the hands of a receiver. (Mar. 25, p. 225.)

CENTRAL PACIFIC.—Senator Gear has reported an amendment of the General Deficiency Bill providing for the appointment of a commission consisting of the Secretary of the Treasury, Secretary of the Interior and the Attorney General to settle the indebtedness to the United States Government of the Central Pacific and Western Pacific roads. The amendment stipulates that no sum less than the principal and interest due shall be accepted.

CHICAGO GREAT WESTERN.—At a special meeting of the stockholders, held at Chicago, June 1, a resolution was unanimously adopted to increase the 4 p. c. debenture stock from $15,000,000 to $30,000,000, as previously announced. (April 8, p. 267.)

CHICAGO, ROCK ISLAND & PACIFIC.—At the annual meeting of the stockholders, held at Chicago, June 1, it was decided to issue new stock to the stockholders amounting to 10 p. c. of the holdings of each. During the period from 1880 to 1885 a sum aggregating about $7,000,000, for which no stock nor bonds were issued, was expended out of the current earnings for permanent improvements and extensions. The new stock represents these improvements. It will be issued July 1, increasing the capital stock to $50,000,000. At the same meeting the quarterly dividend was increased from 1 to 1¼ p. c., beginning Aug. 1. (May 13, p. 349.)

CUMBERLAND & OHIO.—Judge Carroll, at Shelbyville, Ky., May 28, decided that the Louisville & Nashville must continue to operate the Bloomfield branch under the 30-year lease made July 28, 1879. This road, which extends from Shelbyville southwest 26.7 miles to Bloomfield, was sold under foreclosure Dec. 13 last to the Southern, and has recently been incorporated as the Shelbyville & Bloomfield. The L. & N. is given until July 1 to comply with the Court's orders. (April 15, p. 286.)

CLEVELAND, CANTON & SOUTHERN.—As a result of several suits of foreclosure mortgages on this property, Judge Ricks, at Cleveland, O., has ordered the property to be sold for the benefit of the creditors. The master shall accept no less than $50,000 for the Waynesburg & Canton Branch, no less than $50,000 for the Cleveland, Chagrin Falls & Northern Branch, and no less than $1,900,000 for the mortgages covering the rest of the property. The order of sale includes only that part of the system located in the Northern District of Ohio, but the International Trust Co. will make application to Judge Taft of the Southern District for the sale of the property in that district also. This line extends from Cleveland, O., to Zanesville, 144.29 miles, with several branches, making a total mileage of 209.42. A receiver was appointed Sept. 15, 1893. (Mar. 25, p. 226.)

GALVESTON, LAPORTE & HOUSTON.—Upon petition of the Beaumont Lumber Co. and L. J. Smith, Judge Bryant of the United States District Court at Galveston, Tex., has again postponed the sale of this road from June 7 to July 5, to take place at Galveston. An attempt was made to sell the road on May 3, but the highest bid was $350,000, which was considerably below the upset price. (May 20, p. 368.)

GALVESTON UNION PASSENGER DEPOT.—The Texas Railroad Commission has approved for registration an issue of $200,000 stock and $64,000 bonds of this company.

GREAT NORTHERN (CAN.)—This company has asked the city of Quebec for $200,000 30-year 3½ p. c. debenture bonds, of which $50,000 is to be used for the Hawkesbury, Ont., bridge; $50,000 for workshops in Quebec, and $100,000 for completing the line. The City Council has decided to ask authority from the Legislature to subscribe to $200,000 capital stock of the company, payable only upon completion of the line from Quebec to Parry Sound and the building of the workshops in the city. (May 27, p. 382.)

LEBANON SPRINGS.—William Forster, of New York City, is reported to have bought this road. The line runs from Chatham, N. Y., to Bennington, Vt., 57.1 miles. It was opened in 1869, and has been in the hands of the court most of the time since that date. The last receiver was appointed Feb. 27, 1888. All operations were suspended July 30, 1897, and attempts since that time to put the road in operation have failed. (Dec. 3, 1897, p. 862.)

LITTLE ROCK, HOT SPRINGS & TEXAS.—C. T. Coleman has been appointed Master in Chancery to conduct the sale of this road, which is to take place July 9 at Hot Springs, Ark. The upset price is fixed by Judge Williams of the Federal Court at $50,000. This line was chartered in 1893 to run from Little Rock to Wister, I. T., 155 miles, but only four miles of road from Benton, Ark., to the Saline River was finished up to 1895. A receiver was appointed Feb. 24, 1896. (Mar. 4, p. 171.)

MISSOURI, KANSAS & TEXAS.—The Mercantile Trust Co., as trustee for holders of $20,000,000 of 4 p. c. second mortgage bonds executed June 1, 1890, has filed a supplemental bill to its original bill of complaint against the railroad company, filed Feb. 10, 1892, in the United States Circuit Court for the Southern District of New York. The interest on these bonds was payable semi-annually, provided the net earnings of the property, after deducting the maintenance of the road and interest on $40,000,000 of first mortgage bonds, should be sufficient. The complaint alleges that the coupons from Feb. 1, 1891, to Aug. 1, 1895, inclusive, have not been paid; that the net earnings were applied to other purposes than payment of the coupons in violation of the agreement. The complainant asks that a master be appointed to take an account of the operations of the property, and calls for an injunction to prevent the road from using the surplus earnings for purposes other than the payment of the coupons.

MT. CARMEL & NATALIE.—Attorney Oliver P. Scaife, at Pittsburgh, Pa., May 31, made answer in the Court of Common Pleas to the cross bill filed by Thomas C. Lazear and others against this company and the Natalie Anthracite Coal Co., asking for a receiver. The defendants deny the jurisdiction of the court over the property that the road is insolvent or indebted to the plaintiffs in the cross bill, but that a proper accounting between the company and the plaintiffs would make them indebted to the company. They declare that the officers and directors are managing the property in good faith. (Apr. 1, p. 248.)

NORTHERN CENTRAL (P. RR.)—Counsel for this company has applied to the Maryland State Board of Public Works, claiming the right of the company to pay off the 6 p. c. mortgage loan for $1,500,000, made by the State in 1834 to the Baltimore & Susquehanna, which was consolidated with the Northern Central in 1854. At the time of consolidation a new mortgage was made, and a legislative act provided that the consolidated company should bind itself to pay to the State an annuity of $90,000 a year, subject to be extinguished at any time within ten years thereafter upon the full payment of the $1,500,000. State authorities have taken the ground that the option of paying off the loan ceased after the ten-year period, and the company has never previously assumed a contrary position. The State Treasurer has arranged for a sale of the mortgage at nearly $3,000,000, the proceeds to be applied to the debts of the State, but the transaction will be delayed pending the decision of the court.

PENNSYLVANIA.—The Erie & Pittsburgh on July 1 will make an issue of 3½ p. c. bonds maturing July 1, 1940, the principal and interest of which are guaranteed by the P. RR. These bonds are part of an authorized issue of $4,500,000, of which $775,000 is now outstanding, and with the exception of $511,000 equipment bonds of the E. & P., which mature Oct. 1, 1900, are the first lien upon the entire property of the company. The P. RR. gives notice that for each $1,000 bond of the $2,109,000 maturing July 1, it will exchange one new bond valued at $975 and give a cash bonus of $25; and holders of the equipment bonds are notified that until July 1 they can exchange these bonds on the basis of $1,100 flat per bond for the new general mortgage bonds at $975 flat per bond. (Apr. 8, p. 267.)

PENNSYLVANIA COMPANY.—Holders of 4½ p. c. bonds for the sinking fund are notified that $506,475 is set aside to purchase the same on or after July 1 at the office of the National City Bank, New York City, at a price not to exceed par.

Holders of Cleveland & Marietta 4½ p. c. bonds are notified that $12,500 is set aside to buy these bonds on or after July 1 at the Farmers' Loan & Trust Co., New York, at a price not to exceed par.

ST. CROIX & PENOBSCOT.—The City of Calais, Me., has sold for $35,000 its interest in this line to the new Washington County road, now building, giving it controlling interest. The face value of the bonds held by the city is $76,000. The condition of the sale is that the machine shops of the new road are to be built in Calais. The Washington County is to run from Calais southeast about 104 miles along the coast to Ellsworth on the Maine Central. (W. C., June 3, p. 399.) W. B. Parsons is chief engineer, 22 William St., New York.

ST. LOUIS SOUTHWESTERN.—The net earnings from July 1, 1897, to March 31, 1898, show an increase of $261,403 over same months of previous year. The net earnings for these months this year being $1,121,129, against $859,726 for the previous year.

SHEPAUG, LITCHFIELD & NORTHERN.—The stockholders at New Haven, Conn., June 3, voted to lease their line to the New York, New Haven & Hartford for 75 years from July 1. The N. Y., N. H. & H. votes on the question June 15. (May 13, p. 350.)

SOUTHERN.—Forty-seven Georgia Pacific equipment mortgage bonds of 1889 have been drawn for payment at the Central Trust Co., New York, Aug. 1.

UNION PACIFIC, CENTRAL BRANCH.—Charters were filed with the Kansas Secretary of State June 1 for the reorganized companies of the Atchison, Colorado and Pacific, with a capital stock of $4,500,000, and the Atchison, Jewel County & Western, with a capital stock of $1,000,000. The directors of both companies are the same, as follows: J. W. Gleed, C. S. Gleed, E. F. Ware, P. L. Bonebrake, F. M. Bonebrake and J. L. Hunt of Topeka, and Oliver Ames and T. Jefferson Coolidge, Jr., of, Boston. These companies own lines leased to the Central Branch of the Union Pacific and sold two weeks ago to two representatives of the bondholders. They are operated by the Missouri Pacific. (May 13, 20 and 27, pp. 350, 368 and 385.)

WACO & NORTHWESTERN.—The United States Circuit Court at New Orleans, La., has issued orders that Wilbur F. Doyle of St. Louis, Mo., purchaser of the road at the Commissioners' sale on Sept. 3, 1895, comply with the terms of his bid and pay for the property before July 1. The road was placed in the hands of a receiver Dec. 11, 1892. It runs from Bremond, Tex., to Ross, 54.68 miles. Receiver Alfred Abeel of Waco, Tex., is still in possession.

WHEELING & LAKE ERIE.—The Reorganization Committee, consisting of Louis Fitzgerald, J. Kennedy Tod, George Coppell, Eugene Delano and William A. Dick, have announced a plan of reorganization under date of June 6. Under the plan the Lake Erie Division first mortgage, dated July 1, 1886, the Wheeling Division first mortgage, of Apr. 21, 1888, and the extension and improvement first mortgage of Dec. 20, 1889, will be left undisturbed unless refunded by agreement with the bondholders as provided by the plan. The consolidated mortgage is to be foreclosed and the holders of the bonds secured by that mortgage will receive for their principal and accrued interest first preferred non-cumulative 4 p. c. stock in the new company to an amount equal at par to the par value of the bonds with interest at 4 p. c. from Jan. 1, 1897, to July 1, 1898. Holders of these consolidated mortgage bonds who have not yet deposited the same under the bondholders' agreement of July 25, 1897, are given until July 25 to make such deposit with the Mercantile Trust Co., New York. The present preferred stock, which has been deposited with the Central Trust Co., New York, with a cash payment of $1 per share, is to pay an additional $11 and to receive $112 par value in second preferred stock of the new company. The common stock delivered under the same conditions with the payment of an additional $8, is to receive $9 par value in second preferred stock of the new company and $100 in common stock. The remaining payments are to be made in three instalments not less than 30 days apart, of which notice will be given at least two weeks in advance. Holders of Central Trust certificates of deposit for stock of either class must present them to the Central Trust Co., on or before July 25, after which date a further sum of $2 per share will be collected. The Wheeling & Lake Erie runs from Toledo, O., to Martins Ferry, 216.48 miles. It has three branches, making a total mileage of 246.98. It went into the hands of receivers Jan. 15, 1897. (Feb. 11, p. 112.)

WISCONSIN CENTRAL.—The temporary agreement of the receivers with the Chicago, Wisconsin & Minnesota and the Milwaukee & Lake Winnebago leased lines, which became operative April 1, 1897, has expired, and the lines will be operated under the old lease until a hearing is had before Judge Seaman in the United States Court, July 5. These two lines were leased by the Wisconsin Central in 1882 at a rental equal to 37½ p. c. of the gross earnings, not to exceed $350,000 for the C., W & M., nor $175,000 for the M. & L. W. According to recent agreements, these leased lines were to receive each the net earnings of its own property after deducting its proportion of all terminal equipment and other expenses.

Edwin H. Abbot has resigned as Trustee under the last mortgage of the W. C., but will remain as Trustee under the mortgage of 1879. The reason for his resignation is stated to be that he was unable to concur in the policy which the New York Committee of Reorganization was urging upon the Trustees. The New York reorganization Committee was formed in 1894, and its preliminary plans promulgated in December, 1895. All parties interested, including the Boston holders, agreed to a temporary plan in April, 1897, for joint operation of the road pending agreement upon the completed reorganization plan. In December, 1897, the New York committee caused a separate decree of foreclosure on the first mortgage bonds, whereupon the junior security holders immediately formed another committee. The temporary agreement of April 1, 1897, has been discontinued, and all parties are left to stand upon their legal rights under existing contracts and leases. The receivers continue to operate all the lines as a unit. It is expected that the Boston interests will soon publish a new plan of reorganization.

Electric Railroad News.

BLOOMINGTON, ILL.—The Bloomington City Ry., chartered in 1888, was sold at auction for $202,500. The plant consists of 13 miles of track, comprising the main line connecting Bloomington with Normal, 4 miles in length, and a system of branch lines in Bloomington. The line was bought by a local syndicate, at the head of which are John Eddy and A. E. Demange of Bloomington. John Graham of Philadelphia, holder of the second mortgage bonds, is in the syndicate. The plant was covered with three sets of mortgage bonds, the total investment in the road, as represented by the bonds, being over $400,000. The affairs of the company have been in litigation for some years, through contentions between the three sets of bondholders. The plant, it is stated, is in bad condition, and it will take $50,000 to reconstruct it.

BROOKLYN, N. Y.—The gross earnings of the lines of the Brooklyn Rapid Transit Co. for periods ending May 31 were as follows:

May—	1898.	1898.	Inc. or Dec.	
Passenger earnings—B. H. and B. Q. Co. & S. R. Rs.	$510,080	$470,392	I.	$39,688
Other earnings—from operation	18,268	17,667	I.	601
Gross earnings	$528,348	$488,059	I.	$40,289
Eleven months—				
Passenger earnings—B. H. and B. Q. Co. & S. R. Rs.	$4,898,219	$4,627,172	I.	$271,047
Other earnings—from operation	196,970	196,020	I.	950
Gross earnings	$5,095,189	$4,823,192	I.	$271,997

CLEVELAND, O.—Judge Dissette, in the Court of Common Pleas, rendered a decision enjoining the East Cleveland R. R. Co., one of the lines of the Cleveland Electric Ry., from running cars in Collingwood. The suit was brought by the town of Collingwood, because the road did not run cars all winter between Collingwood and Euclid Beach.

GEORGETOWN, KY.—Press reports state that the property and franchises of the Georgetown St. Ry. Co. were recently bought by Mr. D. J. Grover. The road operates only a few motor cars and a little over two miles of track.

OTTUMWA, IA.—It is stated that the Ottumwa Electric Ry. Co.'s property and franchises were recently bought in by E. E. McElroy, trustee for the bondholders, for $190,000. This road went into the receiver's hands in April, 1896. The company operated about 7½ miles of track and owned franchises for electric lighting and steam heating.

TRAFFIC.

Traffic Notes.

The West Shore, in connection with the Nickel Plate, has made a second-class rate of $25 New York to Seattle, to meet the competition of the Canadian Pacific. The cut of over 60 per cent. is reported to be borne almost entirely by the lines west of Buffalo.

The arbitrators of the Joint Traffic Association have decided that fares from St. Louis and points basing thereon to Washington and Baltimore, should be the same via the Chesapeake & Ohio and its Western connections as by all the other lines, viz., $20.25 first class, and $17 second class.

The Southern Pacific put in effect June 5 a reduced second-class rate of $32.50 San Francisco to Chicago, and $42.55 to New York, via El Paso, and in connection with the Santa Fe route, via Mojave, to meet the competition of the Canadian Pacific. The lines via Ogden are at liberty to meet this competition.